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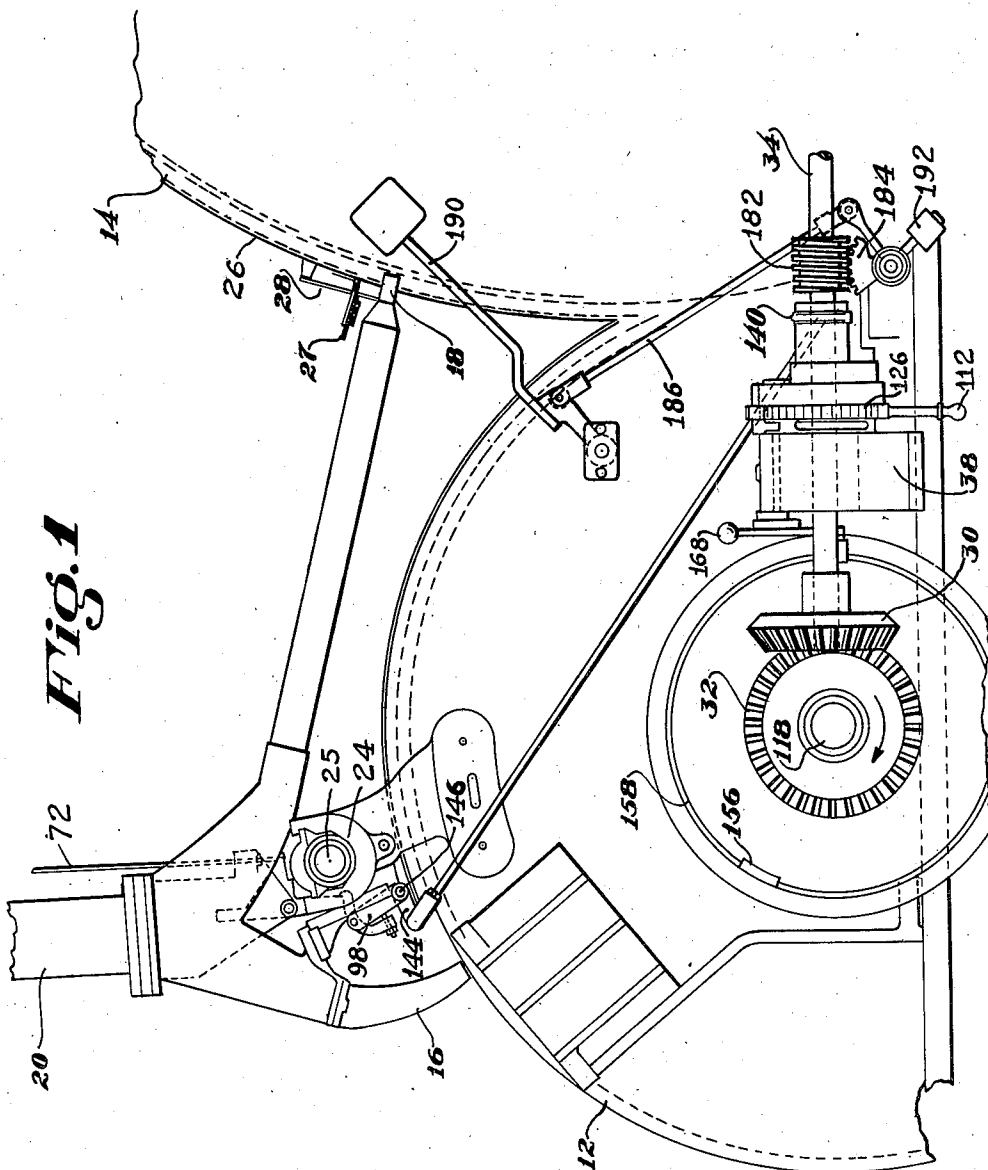
C. E. WHITE ET AL

2,428,255

CARDING MACHINE

Filed July 21, 1945

5 Sheets-Sheet 1



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Fig. 3

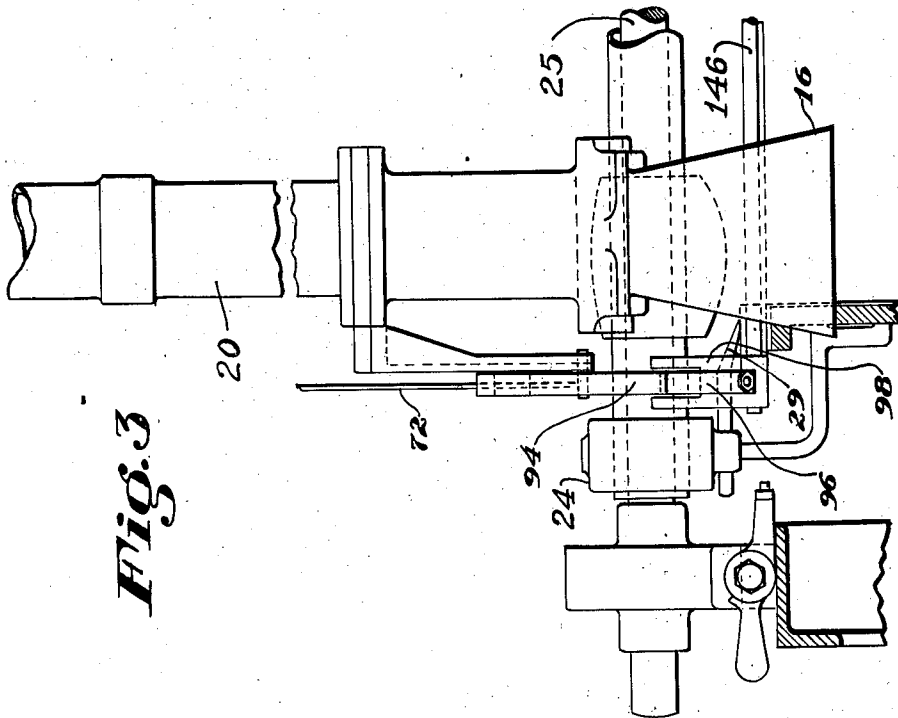
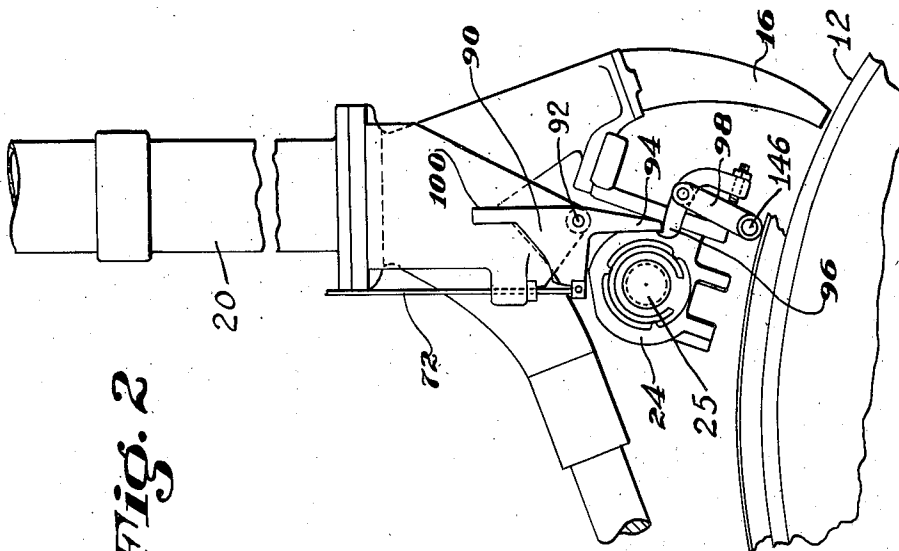


Fig. 2



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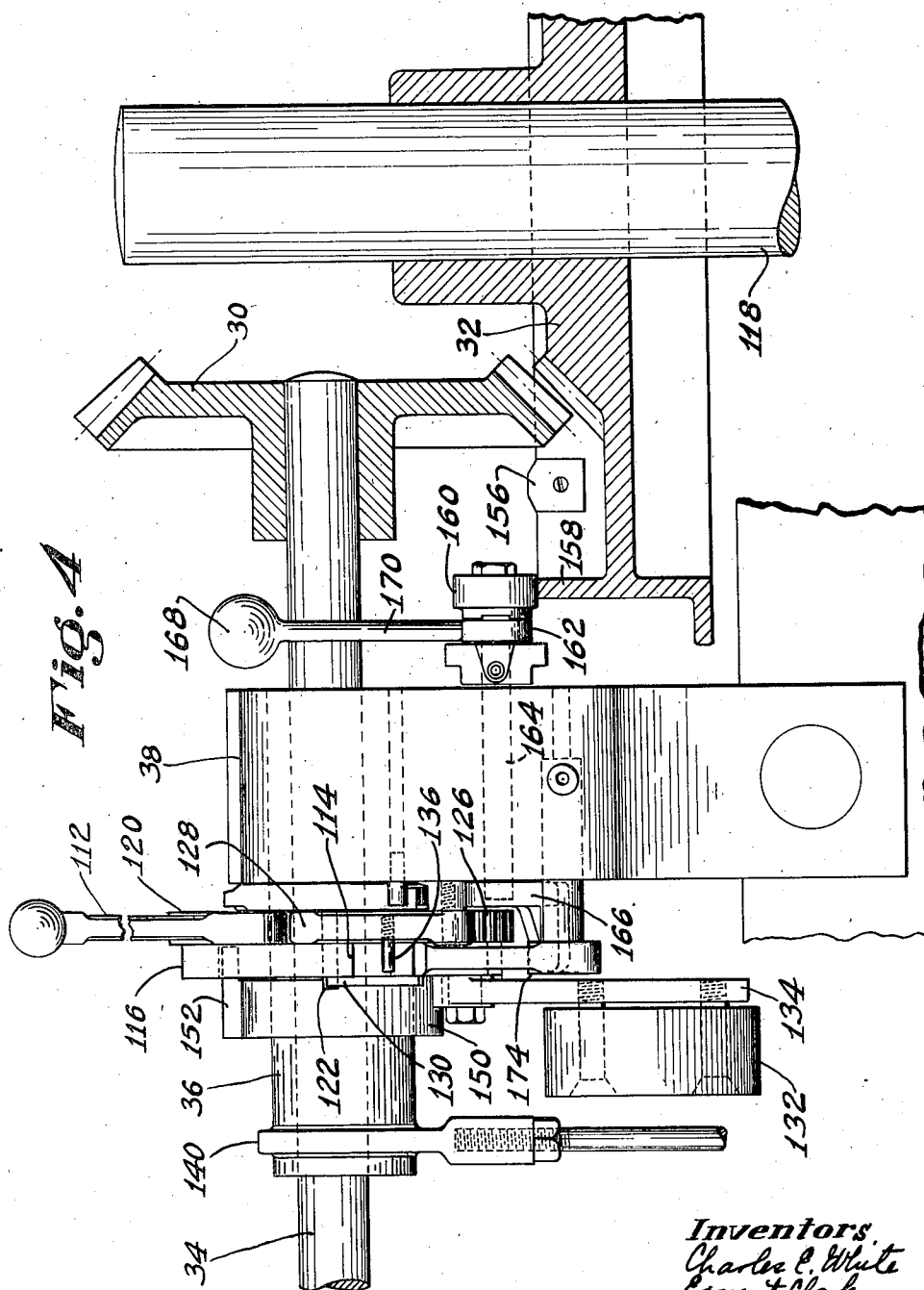
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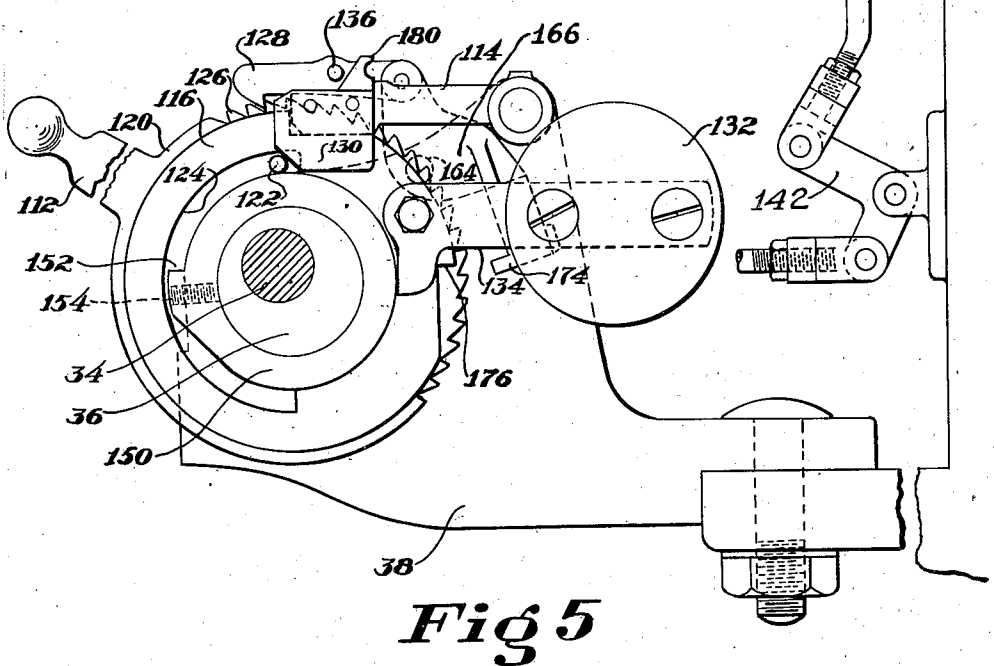
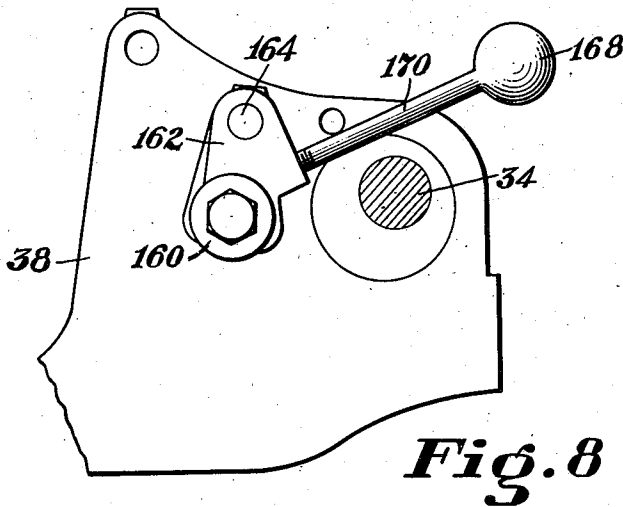
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Fig. 6

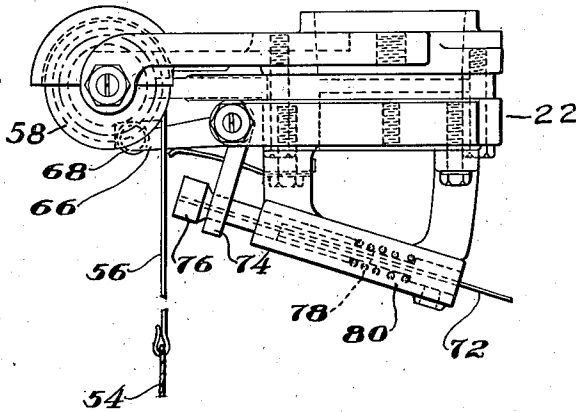
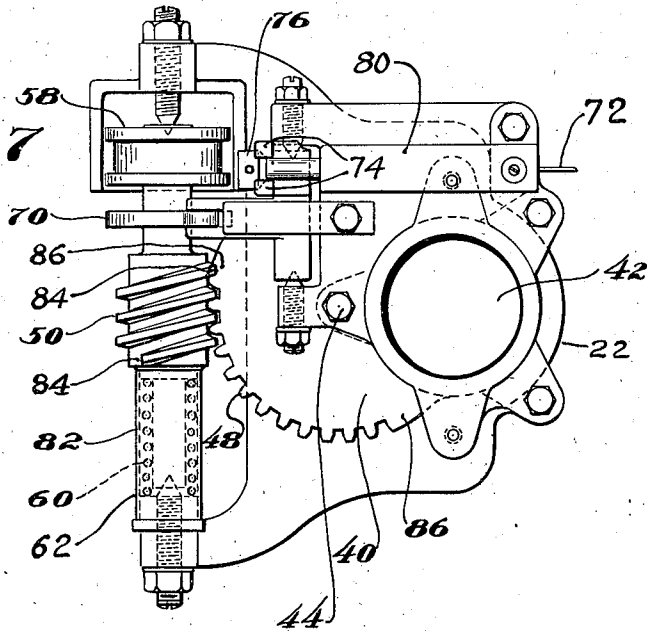


Fig. 7



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UNITED STATES PATENT OFFICE

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CARDING MACHINE

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9 Claims. (Cl. 19—109)

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The present invention relates to carding machines, and more particularly to improvements in pneumatic stripping apparatus of the type shown in Clark Patent 2,281,268 and in White Patent 2,281,344, both dated April 28, 1942.

In the machines shown in said patents, vacuum stripping apparatus is disclosed which is adapted, after the apparatus has been set in motion, to carry out the stripping operation automatically, and on completion of stripping to shut off the suction and to start the feed. As a result, the operator need visit the machine only twice for a stripping operation, once when the feed is disconnected and the stripping is started and again, after the termination of the stripping, when the newly carded material is ready for piecing.

It is the object of the present invention to provide certain simplifications and improvements in the stripping apparatus of said prior patents, so as to permit more effective utilization of substantially automatic stripping mechanism operating in accordance with the general principles disclosed in said patents.

The several features of the apparatus of the present invention will be apparent from the following description and accompanying drawings, in which Fig. 1 is a view in right side elevation of a portion of a carding machine embodying the invention; Figs. 2 and 3 are detail views in left side and in front elevation of the portion of the machine in the vicinity of the suction nozzle; Figs. 4 and 5 are views in plan and elevation, respectively, of the timing mechanism shown in the bottom portion of Fig. 1; Figs. 6 and 7 are detail views of the suction control valve, and Fig. 8 is a detail view of the rocker arm for actuating the timing mechanism. In its general arrangement of the several components the apparatus corresponds to that shown in Fig. 1 of the patent to White No. 2,281,344 already referred to.

The carding machine with which the stripping apparatus of the invention is adapted for use is of conventional construction, employing a doffer 12 and main cylinder 14. To strip these cylinders at periodic intervals, suction nozzles 16 and 18 are provided which are connected by means of a flexible conduit 20 extending upwardly to a control valve indicated generally at 22. This control valve is positioned above the machine substantially as shown in Fig. 1 of the White patent, and similarly is connected by a suction pipe to a suction source, not illustrated. The nozzles 16 and 18 are secured to a nozzle carriage 24 mounted for movement transversely of the machine, be-

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ing caused to traverse the cylinders by means of a rotating screw 25 which is engaged during stripping by a pawl on the nozzle carriage.

The suction nozzle for the main cylinder extends through a slot in the cylinder shroud 26. Except when stripping, the slot is closed by a hinged cover 27. During the traverse of the suction nozzle, the cover is held open by a latch 28, the latch being released by the suction nozzle as the latter completes its traverse.

The traverse mechanism is similar to that disclosed in Clark Patent No. 1,614,103, dated January 11, 1927, wherein the nozzle carriage, during stripping, is advanced by the screw from right to left. As the carriage approaches the end of the cylinder, the pawl is caused to disengage from the traverse screw 25 by means of a release plate 29 onto which the pawl rides.

While the stripping of the cylinders is being carried out, the feed to the doffer is stopped by disconnecting bevel gears 30, 32 by which the doffer 12 is normally connected through longitudinal shaft 34 to the feed shaft, not shown. The disconnection and reconnection of the feed is effected by means of an eccentric bushing 36 carried in bracket 38 and in which the shaft 34 is journaled.

During the stripping operation, the suction valve is latched open by mechanism to be described. According to the present invention, connections are provided by which, after the nozzles have completed their traverse, the suction valve may be closed at the same time that the feed is thrown in. In order that the left hand end of the cylinder may be properly stripped, the suction cut-off does not occur simultaneously with the arrival of the carriage at the end of the traverse, but is effected a sufficient time thereafter to permit one or more revolutions of the doffer to take place. The valve closing is accordingly not determined by the completion of the traverse, but by the rotation of the doffer cylinder, as will hereinafter more fully appear. The valve closing, therefore, while dependent on completion of the nozzle traverse for making the connection in the train of valve release mechanism is nevertheless effected by timing mechanism which is set in operation independently of the nozzle traverse motion.

The suction control valve is of the same general type as that shown in Clark Patent 2,281,268, and includes a valve plate 40 having an opening 42 which is adapted to register with the suction passage when the valve is open. The plate is pivoted on a stud 44 which permits the plate to

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rotate about an axis parallel to the suction passage. The valve is provided with gear teeth 48 with which a worm 50 meshes. The worm is rotatably mounted on cone point set screws to provide, through axial adjustment of the worm, accurate registry of the opening 42 with the suction passage when the valve is open. The worm is rotated to open the valve by means of a pull cord 54 attached to a flexible strip of leather 56 or the like which is wound on a drum 58 on the worm shaft. A spring 60 in housing 62 serves to rotate the worm in the reverse direction to close the valve when the latch, indicated at 66, is released.

The latch comprises a spring-pressed pivoted arm having at its end a roller 68 which is adapted to engage the periphery of a latch disc 70 alongside the worm 50. The disc is notched to permit the roller to enter the notches and thereby act as a detent to prevent rotation of the disc and worm under the torque developed by spring 60 when wound.

The latch is actuated to release the disc and worm, when the valve is to be closed, by means of a flexible cable or Bowden wire 72 extending to connections carried by the nozzle body, mounted on the traverse carriage. At the latch end, the release mechanism includes a latch release arm 74 and Bowden wire end fitting 76, together with a return spring 78 in housing 80.

To provide limit stops by which the range of movement of the valve plate may be accurately determined without the possibility of jamming or locking of the parts, the worm itself is arranged to provide the limit stops. To this end, the threads of the worm are cut away at each end substantially to the bottom of the thread to provide shoulders 84 which, at the proper limit of movement of the valve plate, engage the solid portion 86 of the plate beyond the gear teeth. Since further rotation of the worm is positively prevented by such engagement, no jamming of the worm can take place, such as might occur if rotation of the valve plate were limited by stops.

As it may prove advantageous in certain instances to use a double thread worm in the valve actuating mechanism above described, both threads may be formed with limit shoulders at each end, and the latch disc may have notches at diametrically opposed points, to simplify the assembly of worm and valve plate in the desired relationship.

The latch release mechanism on the nozzle carriage, to which the Bowden wire extends, comprises a bell crank lever 90 pivotally mounted on a stud 92. The Bowden wire connects to one arm of the bell crank, while the other arm 94 extends downwardly and is adapted to be engaged, when the carriage has reached the end of its traverse, by a latch 96 pivotally secured to the end of a latch arm 98 on the machine frame and actuated upon completion of the stripping operation by connections from the timing mechanism about to be described. In order that the operator may close the suction valve independently of the automatic release mechanism, the bell crank lever 90 is provided with an upwardly extending handle 100 easily accessible to the operator.

As has already been indicated, the duration of the stripping operation is determined by timing mechanism controlled by rotation of the doffer, the mechanism being arranged to shut off the suction and at the same time start the feed to the doffer upon completion by the latter of a

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predetermined number of revolutions following the start of the traverse by the suction nozzle. In commencing a stripping operation, the eccentric bushing 36 is rotated to disengage bevel gears 30 and 32 by the operation of lowering handle 112, by which operation the timing cycle is initiated. Rotation of the eccentric bushing is effected by pin 122, which engages shoulder 152 on collar 150. During the stripping operation, the bushing is retained in "disengaged" position by means of a latch 114 which engages a latch disc 116 secured to the eccentric bushing.

The latch is released, after a predetermined number of revolutions of the doffer shaft 118, by means of a ratchet disc 120, to which handle 112 is secured. The ratchet disc is rotatably mounted on the eccentric bushing adjacent the latch disc 116, and is provided with a pin 122 which projects through a semi-circular slot 124 in the latch disc. The ratchet disc 120 is provided with ratchet teeth 126 to enable the disc to be rotated in stepwise fashion by means of a pawl 128 which is reciprocated by connections from the doffer shaft to advance the ratchet disc one tooth for each revolution of the doffer. As the ratchet disc nears the limit of its rotation by the pawl, the pin 122 projecting through slot 124 engages the oblique surface of a latch release plate 130 secured to the latch 114. Further advance of the ratchet disc raises the latch out of locking engagement with the latch disc, allowing the latch disc and eccentric bushing to be rotated, by weight 132 on arm 134 secured to said disc, to a position which causes the bevel gears to mesh and thereby start the feed to the doffer. Lifting of the latch also serves to raise the pawl clear of the latch teeth, this being effected by engagement of the latch release plate with a lockout pin 136 on pawl 128.

The rotation of the eccentric bushing also operates the suction shut-off mechanism. For this purpose a yoke 140 is received within a guide-way in the eccentric bushing, said guideway being eccentrically disposed relative to the axis of the bushing. By connections including bell crank lever 142, rock arm 144 and rock shaft 146, to which latch arm 98 is secured, the valve release mechanism may be tripped to shut off suction at the same time feed is resumed.

The duration of the timing cycle may be adjusted by means of a collar 150 having a shoulder 152 which is engaged, when the handle 112 is lowered, by the pin 122 projecting through the latch disc slot 124 from the ratchet disc 120. The collar is secured to the eccentric bushing by means of a set screw 154. By adjusting the position of the collar on the bushing, the effective length of the arcuate slot 124 in the latch disc 116 may be varied. Upon the length of this slot depends the number of ratchet teeth on the ratchet disc 120 that pass the pawl when the handle 112 is swung down to initiate the timing cycle. Since the latch plate must in every instance be returned to the same position to release the latch, the number of teeth passing the pawl during the downward movement of the handle determines the number of revolutions made by the doffer during the timing cycle.

The actuation of the pawl to advance the ratchet disc during stripping is accomplished by a cam block 156 secured to the rim of a pulley 158 associated with bevel gear 32 on doffer shaft 118. The cam block engages a roller 160 on a rock arm 162 (see Fig. 8) secured to one end of a rock shaft 164 which extends through the bracket 38. The pawl is pivotally connected to a

rock arm 166 secured to the other end of the rock shaft. A weight 168 supported on a bracket 170 secured to rock arm 162 tends to rotate the latter in a direction to maintain the roller 160 in operative relation to the cam block.

In connection with the operation of a carding machine, it is necessary periodically to grind the ends of the wires on the doffer. During this operation it is essential that the feed remain off. To insure that the feed will remain locked out during this operation, the timing mechanism is arranged to permit the feed to be locked out by positive means. This is accomplished by ratchet lock 174 on the rock arm 166. This lock is adapted to engage a shoulder 176 on the latch disc when the eccentric bushing is in a position in which the bevel gears are disengaged. The lock is maintained by lifting both the pawl and the latch and causing the pawl lock-out pin 136 to engage a notched lug 180 upstanding from the latch release plate 130. Such engagement requires rotation of the rock shaft 164 to such position that the ratchet lock 174 positively engages the shoulder 176. Under these conditions both the pawl and the latch remain unaffected by doffer rotation, as the cam roller is held away from the cam block. While normally, during stripping, the operator may, if desired, shut off the suction and throw in the feed before a traverse has been completed, merely by lifting handle 112 and causing the latch to be released, the positive lock-out can be released only disengaging the lock-out pin from behind the latch plate lug, thus insuring against accidental resumption of the feed during grinding.

To assist the operator, who may have several machines in his charge, in supervising the operation thereof, means are provided for indicating when the sliver is up to weight and ready for piecing, following the completion of a stripping operation and resumption of feed. The indication is given by a signal arm 190 which is caused to rise, after the doffer has rotated a predetermined number of revolutions with feed in, sufficient to build up the required weight of newly formed sliver for piecing to the end of the sliver produced prior to the stripping operation.

The signal flag is actuated by connections from longitudinal shaft 34 comprising worm 182 secured to the shaft, sector 184, and link 186. The sector is so mounted in relation to the worm that when the feed is thrown out by rotating the eccentric bushing 36 to disengage the bevel gears 30, 32, the worm and sector are likewise disengaged. The signal flag then drops to horizontal position under the influence of counterweight 192. Throughout the stripping operation, the worm and sector remain out of engagement, but upon completion of the stripping and resumption of feed, by rotation of the eccentric bushing by the timing mechanism, the worm and sector are engaged. Rotation of feed shaft 34 thus moves sector 184 counterclockwise to swing the signal flag upwardly. After the doffer has rotated a predetermined number of turns sufficient to build up the sliver for piecing, the sector runs off the worm. At this time the flag is vertical, indicating to the operator that the stripping operation has been completed, that feed to the doffer has been resumed, and that the step of piecing the sliver is now ready to be performed to resume carding. (As shown in Fig. 1, the parts are in intermediate position, the flag having risen about half-way toward signal position.) During the normal carding operation the flag remains ver-

tical and the end of the sector clicks against the worm, so that upon the next interruption of feed the flag will drop.

The timing mechanism, with its associated actuating connections, permits stripping to be carried out accurately and with a minimum of attention. To initiate a stripping operation, the operator shifts the nozzle across the machine, at the same time pulling on cord 54 to open the suction control valve. The operator then lowers handle 112 of the timing mechanism to the limit of its movement, to throw out the feed and initiate the timing period for the stripping. The signal flag now drops, and the machine is allowed to proceed automatically with the stripping. When the nozzle reaches the limit of its traverse, the connections between the timing mechanism and the valve release are completed, preparatory to actuation. After the timing mechanism has run through the remaining rack teeth to allow for stripping the end of the cylinder, these connections are actuated to shut off the suction at the same time the feed is resumed. When the sliver has built up on the doffer to the proper condition for piecing, the signal flag rises, indicating to the operator that the machine is ready for piecing and resumption of carding.

It is thus apparent that the stripping mechanism hereinbefore described provides substantially complete automatic operation, the services of the operator being required only at the start, to initiate the stripping operation, and again after the stripping, when the sliver has been built up sufficiently for piecing. By employing timing mechanism of novel and improved arrangement, a simple and readily adjustable control of the stripping operation is provided to insure full stripping of the doffer in the minimum time.

We claim as our invention:

1. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing mechanism for the nozzle, a suction valve, means for applying suction to the nozzle including a flexible suction conduit between the valve and the nozzle, valve-control means mounted on the nozzle for traversing movement therewith, flexible connections between said means and the suction valve, timing means operated by rotation of the doffer, and actuating connections extending from the timing means to a point adjacent the suction nozzle at the limit of its traverse and engaging the valve-control means upon completion of nozzle traverse, said connections being actuated by the timing mechanism a predetermined number of revolutions of the doffer after completion of the traverse to operate the valve-control means on the nozzle and shut the suction valve.

2. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing means for the nozzle, means for applying suction to the nozzle, a suction control valve, and timing mechanism having connections for effecting suction valve shut-off and feed re-connection after a stripping operation, said mechanism comprising a pawl actuated upon each revolution of the doffer, a ratchet advanced by the pawl, a latch disc in control of suction shut-off and feed re-connection, a latch locking the latch disc during stripping, means on the ratchet for releasing the latch to effect suction shut-off and feed re-connection, and means for adjusting the effective length of the ratchet to cause release of the latch a predetermined number of revolutions of the doffer after completion of nozzle traverse.

3. In a carding machine, pneumatic stripping

mechanism including a nozzle, traversing mechanism for the nozzle, means for applying suction to the nozzle, a suction control valve, and timing mechanism having connections for effecting suction valve shut-off and feed re-connection after a stripping operation, said mechanism comprising a pawl actuated upon each revolution of the doffer, a ratchet disc, a latch disc concentric therewith and rotatable to effect suction valve shut-off and feed re-connection, a latch locking the latch disc against rotation during stripping, and means on the ratchet disc for disengaging the latch from the latch disc to effect suction shut-off and feed re-connection in timed relation to the number of revolutions of the doffer.

4. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing mechanism for the nozzle, means for applying suction to the nozzle, a suction control valve, and timing mechanism having connections for effecting suction valve shut-off and feed re-connection after a stripping operation, said mechanism comprising a pawl actuated upon each revolution of the doffer, a ratchet disc, a latch disc concentric therewith and rotatable to effect suction valve shut-off and feed re-connection, a latch locking the latch disc against rotation during stripping, a release pin on the ratchet disc for disengaging the latch at the limit of advance of the ratchet disc by the pawl, and an adjustable stop fixing the initial setting of the ratchet disc to control the effective length of the ratchet disc engageable by the pawl.

5. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing means for the nozzle, means for applying suction to the nozzle, a suction control valve, and timing mechanism having connections for effecting suction valve shut-off and feed re-connection after a stripping operation, said mechanism comprising a pawl actuated upon each revolution of the doffer, a ratchet advanced by the pawl, a latch disc in control of suction shut-off and feed re-connection, a latch locking the latch disc during stripping, means on the ratchet for releasing the latch to effect suction shut-off and feed re-connection upon timed advance of the ratchet by the pawl, and supplemental latching means associated with the pawl for locking the latch disc in feed-disconnected position and for locking the pawl out of operative engagement with the ratchet to permit continued rotation of the doffer with the feed disconnected.

6. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing mechanism for the nozzle, a suction valve, means urging the valve to closed position, a latch for holding the valve open against the urging of said means, a flexible suction conduit between the suction valve and the nozzle, latch-actuating means mounted on the nozzle for traversing movement therewith, flexible connections between the latch and said latch actuating means, timing means operated in timed relation to doffer rotation, and actuating connections extending from the timing means to a point adjacent the nozzle at the limit of its traverse and engaging the latch-actuating means on said nozzle upon completion of nozzle traverse for releasing the latch to shut

off suction after nozzle traverse and actuation of the timing means.

7. A suction control valve for a carding machine comprising a valve body having a valve passage therethrough a rotatable valve plate having an aperture therein adapted to register with the valve passage when the valve is open, a worm engaging gear teeth in the valve plate for rotating the plate into and out of open position, means for rotatably urging the worm to one position of the valve, and a pull cord for effecting rotation of the worm to the other position of the valve, the worm threads terminating in shoulders adapted to engage the valve plate beyond the gear teeth to limit the range of movement of the valve plate.

8. In a carding machine, pneumatic stripping mechanism including a nozzle, traversing mechanism for the nozzle, a suction control valve, main timing means operating in timed relation to rotation of the doffer for controlling suction shut-off and feed re-connection following a stripping operation, and supplementary timing means having a signal device controlled thereby and initiated in operation by feed reconnection to actuate the signal device upon completion of a predetermined number of revolutions of the doffer following completion of stripping and resumption of feed.

9. In a carding machine, pneumatic stripping mechanism including a nozzle, nozzle traversing mechanism, a suction control valve, a feed shaft, an eccentric bearing therefor rotatable to connect and disconnect the feed and doffer shafts, and timing mechanism mounted on said bearing and in control of rotation thereof to effect reconnection of the feed and suction valve shut-off upon completion by the doffer of a predetermined number of revolutions, said timing mechanism comprising a latch disc secured to the bearing, a latch locking the latch disc in feed-disconnected position of the bearing, means rotatably urging the latch disc and bearing into feed-connected position, a ratchet disc rotatable on the bushing, a lost-motion connection between ratchet disc and latch disc comprising pin and arcuate slot, a stop adjustable relative to the slot to limit the effective length thereof, a pawl actuated by rotation of the doffer shaft to advance the ratchet disc step-wise, and a latch plate associated with the latch and engaged by the pin for disengaging the latch from the latch disc to terminate the timed period and reconnect the feed.

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The following references are of record in the file of this patent:

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13,376	Great Britain	1912
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