DOFFING MECHANISM FOR LAP-FORMING MACHINES


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8 Claims. (Cl. 242—55.1)

The object of this invention is to provide an improved form of doffing mechanism in a textile lap-forming machine of the known kind in which the roller upon which the lap is formed is constrained to follow an upward movement during the formation of the lap, as the diameter of the lap increases, the ends of the lap roller being rotatably supported in bearings incorporated in members, usually termed "rack-heads," which are mounted for slidability in a vertical direction.

In a doffing mechanism in accordance with the invention, movements of the rack-heads are utilized to actuate mechanisms which are effective positively to perform the respective operations of ejecting a completed lap from the rack-heads, loading a fresh lap roller thereonto and wrapping the leading edge of the new lap around the lap roller when the latter reaches the lap-forming position, said mechanisms being mounted on fixed parts of the machine and actuated by the cooperation therewith of members moving with the rack-heads.

The present improved mechanism is of considerably greater simplicity than apparatus hitherto proposed for this purpose. It also possesses the advantages that the operations of removing the completed lap from the rack-heads and of loading a fresh lap-roller thereonto are performed positively, permitting the several movements of the machine to be executed accurately in the required timed relationship.

One embodiment of the invention is illustrated in, and is hereinafter fully described with reference to, the accompanying drawings. In said drawings, Fig. 1 is a side elevation of the lap-forming machine; Fig. 2 is an elevation of the machine as viewed in the direction of the arrow A in Fig. 1, the lap-cradle being omitted for greater clarity; Fig. 3 is a fragmentary elevation as viewed from the side opposite to that shown in Fig. 1; Figs. 4, 5 and 6 are fragmentary views of the operations of removing the loaded lap from the rack-heads or the operating and reloading mechanisms illustrated in Fig. 1, respectively showing the parts thereof in the positions occupied at three distinct stages in the operating cycle; Figs. 7 and 8 are fragmentary views of the lap-forming mechanism, depicting the manner in which the formation of a lap is initiated; and Fig. 9 is a diagram relating to the electrical circuits and automatic switches by which the mechanism is controlled.

As will be seen from the drawings, the machine incorporates the conventional features of a lap-forming machine, comprising the stack of cal-
swan-neck lever 36, 31 so that the latter rocks into a position in which the drop lever 33, being no longer supported, falls and disengages the pinion 33 from the calender roll spur wheel 36, thereby discontinuing the feed of the lap through the calender roll stack. The rotation of the rollers 5, 6 continues, however, with the result that the lap-end is broken, and the loose end of the lap is completely wrapped around the same. At this stage the parts have reached the position illustrated in Fig. 4, the completed lap being indicated by the reference character 37.

When the swan-neck lever 36, 31 is rocked as aforesaid, a connection 38 with the arm 31 operates a time-switch 39 which, after a sufficient delay determined thereby to ensure the lapping of the last turn of the lap, closes the circuit of an electric motor 40 which drives the rack-head pinions 16 through a chain 41 meshing with a sprocket (not shown) on the shaft 17. This serves to raise the rack-heads 7, 8 from the position shown in Fig. 4 up to the slotted members 11, 12, carrying the completed lap with them until, when the clamping position shown in Fig. 5 is reached, the pegs 42 engage in the rack-heads 7, 8 inimical against the lower edges of a pair of abutments 43 which are pivotally mounted at 44 upon the members 11, 12. Also pivoted at 45 and adjustably fixed to said abutments 43 by setscrews 45 are a pair of elevator members 46, and the arrangement is such that although said elevator members 46 normally depend in the inoperative position shown in Fig. 4, they are actuated by the impingement of the pegs 42 with the abutments 43 in such manner as to engage the projecting ends of the rack-roller 14 and slide the lap laterally (as shown in Fig. 5) from the open bearings 13 of the rack-heads 7 with sufficient force to propel it on to the cradle 47 (see Fig. 1). After the pegs 42 have passed beyond the abutments 43 the elevator members 46 are free to fall back to the inoperative position shown in Figs. 1 and 6.

From the clamping position shown in Fig. 5, the rack-heads continue to rise to the re-loading position shown in Fig. 6. As they approach this position, the pegs 42 impinge against the underside of a pair of levers 48, which are pivoted at 49 and with which are respectively associated two arms 50 which are recessed to provide jointly a support for a fresh lap-roller 14. The upward movement of the pegs 42 turns the arms 50, which have hitherto been located in the position shown in Fig. 5 by the torsion springs 49 (Fig. 2), downwardly until the lap-roller 14 supported thereby is presented to and declassified upon the protection 13 of the rack-heads 7, 8, the arms 50 moving rearwardly until engaged by the retaining catches 51, as shown in Fig. 5.

The pivotal movement of the levers 48, which occurs when the fresh lap-roller is delivered to the rack-heads 7, 8, is utilised to set the calender roll stack in motion so as to feed the web forward across the fluted rolls 5, 6 in readiness for the commencement of the next lap-building operation. This is achieved through the medium of the link 40 which connects one end of said levers 48 to the drop-lever 33 and raises the latter so that it will again be supported by the swan-neck lever 30, 31, with the pinion 33 and the spur wheel 36 again in mesh; the time-switch 39 is simultaneously re-set. The arm 31 of the lever 30, 31 being weighted, this lever is caused to assume its initial position as soon as the lever 27 is released from its engagement by the lug 26 on the continued rotation of the wheel 25.

During the upward movement of the rack-heads 7, 8, as hereinafter described, the rotary motion of the shaft 17 is transmitted through the spur wheel 52, a pinion 53, a spur wheel 54 and a pinion 55 (Figs. 1 and 2) to a lead-screw 56. Working on said lead-screw 56, but slightly mounted on the axis of the motor 40. The reversal of the motor 40 drives the rack-heads 7, 8, downwardly towards the lap-forming position shown in Fig. 1, the lap-roller 14 passing clear of the arms 50 which remain in the retained position until the pegs 42 strike the upper edges of the abutments 43, whereby the elevator members 46 are caused to swing rearwardly so that they abut against and actuate a pair of bell-crank levers 56 upon which the retaining catches 51 are pivoted; the pivotal movement of said levers 50 releases the catches 51 so that they are then free to swing forwardly and upwardly in readiness to receive another empty lap-roller.

During the downward movement of the rack-heads 7, 8, the lead-screw 56 drives the nut 57 towards the right-hand end thereof until, when the empty lap-roller reaches the position shown in Fig. 1, the finger 58 operates a cut-out switch 61 which interrupts the circuit of the motor 40 and stops the rack-heads 7, 8. By now the web fed forward by the calender rolls has arrived at the position depicted in Fig. 7, when the lap-roller 14 and the fluted rollers 5 and 6 is received in the bight of the web which is formed between the fluted rollers 5 and 6.

Before the formation of a new lap can commence it is necessary to wrap the leading end of the web 62 around the lap-roller 14. This operation is performed by the mechanism shown in Figs. 7 and 8 and which consists of a curved plate 63 which extends across the machine and is guided by pegs 64 which work in tracks provided in the inward faces of a pair of side-plates 65, 66. Said plate 63 is also pivotally connected at each end to a double-armed lever 67, 68 which is pivoted at 69 and which carries on its arm 68 a bowl 70 which, when the rack-head 7 approaches its lowestmost position, is impinged against by an abutment 71 and depressed as shown in Fig. 8, causing the plate 63 to move forward so that its nose 63 engages the underside of the leading edge of the web 62 and turns the latter over the upper surface of the lap-roller 14. The lap-roller 14 being now pressed against the fluted rollers 5, 6, it commences to revolve (in an anti-clockwise direction, as seen in Fig. 8) and the formation of a new lap is initiated.

On the forward movement of the plate 62, the pegs 64 travel along the tracks 72 of the side plates 65 and 66, but on the return movement of the plate 63—which takes place as soon as the rack-heads 7, 8 have risen sufficiently to release the levers 67, 68—said pegs 64 are arranged to travel over the upper surfaces of two fingers 73 thereby ensuring that the plate 63 is held clear of the lap and prevented from dragging over the surface thereof. Said fingers 73 are pivotally mounted on the plates 65, 66 so that when the pegs 64 approach the rearward end of their stroke they are permitted to fall back upon the tracks 72.

In order to preserve a constant pressure-on
the lapped web, the degree of braking pressure exerted on the drum 15 is progressively adjusted as the lap-building operation proceeds. For this purpose a weight 74 is slidably mounted on the lever 19, being driven towards the free end thereof by means of a lead-screw 16 which co-operates with a nut 75 on said weight 74 and which is driven by a power shift 17 through a chain 18, a sprocket 79, and a pair of skew-gears 80, 81. It will be understood that when the rack-heads 7, 8 return to the position of Fig. 1 after being furnished with a fresh lap-roller, the said gearing restores the weight to the position in which it is nearest the fulcrum of the lever 19.

A safety over-load slipping clutch of any suitable type is provided at 82 on the driving shaft of the motor 40.

The lap-tray 41 is spring-mounted, as shown in Fig. 1, and a switch 83 associated therewith is arranged to interrupt the circuit of the motor 40 when a lap is upon said tray in order to ensure that said motor 40 cannot be re-started to initiate a new doffing operation until the lap previously ejected has been removed from the tray. Where a guard is provided to enclose the mechanism as indicated by the dotted line 84, it may be associated with a switch (shown only in Fig. 9), for ensuring that the motor 40 cannot be started when the guard is not in the safety position.

The circuit diagram contained in Fig. 9 is largely self-explanatory. The reference numeral 85 indicates a starter switch, which may be of any conventional type (e.g. a star-delta switch), for starting and reversing the motor 40. Assuming that the lap-tray switch 83 and the guard-switch 85 are closed, the closing of the time-switch 93 starts the motor 40 to drive rack-heads up to the loading position. The coil 87, which is part of the switch 85, is energized to operate the magnetic switch 88, so that the motor circuit will remain complete even though either of the switches 83 and 85 should be broken, and the motor 40 will continue to run notwithstanding the opening of the switch 83 when the nut 57 has travelled away from it. When the nut 57 reaches the switch 61 on the rack-heads resuming the lap-forming position, the switch 51 is opened and the motor 43 is stopped. The switch 61 will next be closed, to permit the motor 40 to be re-started for the next upward movement of the rack-heads to the ejecting and loading positions, by the upward movement of the rack-heads as the building of the lap proceeds.

What we claim as our invention and desire to secure by Letters Patent is:

1. In a lap forming machine, a lap roll doffing mechanism comprising, in combination, means for feeding a web, a pair of rack-heads engageable with the journals of a lap roll, means for driving the rack-heads away from their lap rolling position when a roll of lap is complete and for thereafter returning them to their normal position, automatic means for interrupting the web feed after a predetermined period of lap rolling operation, and, after a short delay, for starting said driving means to initiate the upward movement of the rack-heads, said rack-heads including members engageable beneath the lap roll journals to carry a full lap roll away from lap rolling position and to carry a fresh lap roll into lap rolling position, normally inactive ejector members, operating means responsive to movement of the rack-heads away from lap rolling position to actuate the ejector members, for causing them to dislodge the lap roll from the lap roll supporting members of the rack-heads, a temporary loading support for a fresh lap roll, means responsive to continued movement of the rack-heads away from normal position for causing said loading support to transfer the fresh lap roll to the lap roll supporting members of the rack-heads, a member movable to wrap the leading end of the lap around the fresh lap roll as the rack-heads return to lap rolling position, and means responsive to such return movement of the rack-heads for actuating said wrapping member.

2. In a lap forming machine, a lap roll doffing mechanism comprising, in combination, means for feeding a web, a pair of rack-heads engageable with the journals of a lap roll, mechanism for driving the rack-heads upward away from their lap rolling position when a roll of lap is complete and for then returning the rack-heads to their lap rolling position, automatic means for interrupting the web feed after a predetermined period of lap rolling operation, and, after a short delay, for starting said driving mechanism to initiate the upward movement of the rack-heads, said rack-heads including members engageable beneath the lap roll journals to take over support of the lap roll and carry it upward away from lap rolling position with the rack-heads, normally inactive ejector members, operating means responsive to upward movement of the rack-heads to actuate the ejector members, causing them to dislodge the lap roll from the lap roll supporting members of the rack-heads, a loading support for a fresh lap roll located above the ejection position of the lap roll supporting members of the rack-heads, means responsive to further upward movement of the rack-heads for snapping said loading support into position to transfer the fresh lap roll automatically onto the lap roll supporting members of the rack-heads, a member movable to wrap the leading end of the lap around the descending iron lap roll as the rack-heads approach lap rolling position near the end of their downward movement, and means responsive to such downward rack-head movement for actuating said wrapping member.

3. A lap forming machine as set forth in claim 2 in which the mechanism for driving the rack-heads includes means for automatically effecting the reversal of the upward movement of the unloaded rack-heads to return them to the lap rolling position, means to reposition the web subsequently with said reversal, and means to arrest the rack-heads upon the resumption of the lap rolling position.

4. A lap forming machine as set forth in claim 2 in which the ejector members comprise a pair of parallel ejector levers connected for operation in unison, the machine including framing members pivotally supporting the ejection members, the operating means for said ejection members being disposed to be impinged upon by portions of the rising rack-heads and to cause the levers to en-
gage the respective projecting ends of the lap roll and push the roll with the completed lap clear of the roll supporting members of the rack-heads.

5. A lap forming machine as set forth in claim 2 in which the loading support for the fresh lap roll comprises a pair of parallel levers connected for operation in unison, the machine including frame members pivotally supporting the levers, the operating means for shifting the loading support comprising projecting members unitary with the levers and engageable with projecting members on the rising rack-heads and pivotally movable thereby to present the lap roll to the lap roll supporting members of the rack-heads, the machine further including means for retaining the levers in a position clear of the deposited lap roll pending the return of the rack-heads far enough to carry the roll clear of the lever paths, means for automatically releasing the levers thereafter, and means for restoring the levers to their original positions when so released.

6. A lap forming machine as set forth in claim 2 in which the rack-heads further include inverted bearings which rest on the lap roll journals as the journals are caused to rise in response to the build-up of the lap on the lap roll, and in which provision is made of means for applying a braking force to the upward movement of the rack-heads, and of means for automatically regulating the braking force in proportion to the increasing lap diameter.

7. A lap forming machine as set forth in claim 2 in which a driving electric motor is provided for operating the rack-head and in which the means for automatically interrupting the web feed comprises a wheel and wheel driving means engageable with the lap for measuring the length of lap fed, a lug carried by the wheel, a tripping gear engaged and actuated by the lug for stopping the web feeding mechanism, and a time switch also operated by said tripping mechanism for governing the starting of the rack-head driving motor.

8. A lap forming machine as set forth in claim 2 in which the mechanism for driving the rack-heads up and down comprises an electric motor and a rack-head driving gear, and which further includes electrical switches governing the circuit of the rack-head driving motor, a lead screw, a driving nut mounted thereon and driven through the lead screw from the rack-head driving gear, said switches being responsive to the driving nut and serving respectively to effect the reversal of upward movement of the unloaded rack-heads, and the stoppage of the rack-heads upon the regaining of the lap rolling position by them.

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