MACHINE FOR FORMING AND DOFFING LAPS AND THE LIKE

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This invention concerns machines for forming and doffing fibrous laps and other packages of material.

Machines are known for forming laps or the like in which an elongated fibrous web is fed to a shaft or bobbin and wound thereon under load. The present invention is especially, but not exclusively, concerned with machines of this type.

In the known machines referred to it is usual for a pair of rotating cylinders, known as shell rollers, to be disposed parallel to each other so as to form a horizontal support for the shaft or bobbin onto which a fibrous lap is to be wound. By driving the shell rollers winding of the lap proceeds, and the necessary load is applied either to the ends of the shaft or bobbin by suitable members, or to the lap periphery by means of a third roller, in either case, of course, being directed towards the nip of the shell rollers. In order to doff the full lap automatically without stopping the machine it is necessary to relieve the completed lap of load, remove the lap, introduce a new bobbin or shaft, and re-impel the load on the new lap being formed. With conventional loading arrangements this is difficult because of the necessarily massive construction of the moving parts and it may only be possible to operate effectively at speeds well below those desired.

The principal object of the present invention is to provide a machine for forming and doffing fibrous laps and the like which is not subject to the disadvantages hereinbefore referred to.

According to the present invention a machine for forming and doffing laps and other packages comprises means for rotatably supporting a package during formation, cam means whereby at the same time, load is applied to the package, and means for causing such relative motion between the cam means and the package supporting means that the required load is always applied to the package during formation but is released after the package reaches its full size. The cam means may present stationary, rigid, curved load-applying surfaces to axial extensions of the member on which the material of the package is wound. Alternatively, the cam means may be rotatable. The package may be rotatably supported by rollers. In a preferred arrangement the supporting rollers are two of a cluster of such rollers, the cluster and the individual rollers thereof each being rotated at appropriate speeds in such manner that on release of the completed package from loading the building up of a further package under the influence of the loading effected by the cam means commences on a different pair of supporting rollers of the cluster.

The invention will now be described further, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a lap-forming machine according to the invention;
FIGURE 2 is a side elevation of the machine shown in FIGURE 1 partly in section, and with parts broken away to enable the manner in which the machine functions to be more clearly understood;
FIGURE 3 is a detail side elevation of part of the machine shown in FIGURES 1 and 2 showing a fully formed lap just prior to doffing;
FIGURE 4 is a detail side elevation showing a fully formed lap just doffed and the formation of a new lap;
FIGURE 5 is a detail side elevation showing a partly formed lap;
FIGURE 6 is a detail view partly in section of part of the machine shown in FIGURE 1;
FIGURES 7a and 7b are further detail views of another part of the machine shown in FIGURE 1 in two different operative positions.

The machine illustrated is a lap forming machine especially adapted for use in the continuous process described in our U.S. Patent No. 3,013,313. In the specification of our U.S. Patent aforesaid, we describe a process for the production of textile yarns which includes the steps of carding a mass of staple fibres on each of a plurality of carding machines, and then drafting the carded masses. According to the invention described in our U.S. patent aforesaid, in such a process a plurality of masses of staple fibre are carded simultaneously to produce a corresponding number of fibrous webs (as distinct from slivers) and then said webs are superimposed and drafted together to form a single lap, these operations proceeding continuously in sequence, the drafting effect on the superimposed webs being adjusted according to the number of webs at any given time, so that a single lap of substantially constant characteristics is always produced for further processing.

In the specification of our U.S. patent aforesaid, we describe, by way of example, a continuous process for the production of textile yarns involving the sequential use of one scutcher, twelve carding engines, one lap former and eight drawing heads, fibrous material from which yarn is to be made being successively processed by the different machines.

The lap forming machine about to be described is especially adapted for use in the continuous process just referred to, and is capable of receiving the superimposed webs from twelve carding machines, and producing laps for further processing in the eight drawing heads.

Referring in particular to FIGURES 1 and 2 of the accompanying drawings, the lap forming machine incorporates means for drafting superimposed webs, and for feeding the single web thus produced to a lap forming station, means for forming a lap at that station, and means for progressing each lap when complete having previously provided for the commencement of the formation of a further lap at said station.

The machine consists of a framework 11 which supports the various elements of the several means to which reference has just been made.

At the right hand end of the machine as shown in the drawings is provided a drafting system consisting of four bottom rollers 12, 13, 14, 15 and two top rollers 16, 17. Next to this drafting system in the direction of travel of the web 18 through the machine (that is to say, from right to left in the drawings) is means operative to guide the web 18 moving through the machine to be substantially weakened transversely in preparation for the severance of the web as the formation of a new lap commenced. This means consists of a bar 19 eccentically mounted for rotation above the web and an upwardly spring-loaded roller 28 parallel to the eccentrically mounted bar 19 and so disposed beneath the web 18 that the web will normally pass in light contact with it. The bar 19 is so mounted that on rotation it will be caused to contact the web at one part of its revolution, and the linear speed of the contacting edge of the bar 19 arranged to be somewhat less than the linear speed of the web 18, whereby, when the bar 19 contacts the web it serves to hold it back at the contact region so that a considerable weakening at that region occurs. The bar mounting is driven from a mechanism 21 controlled by a solenoid 21a which is adapted to cause the bar 19 to...
3 make one single revolution at the appropriate time. The mechanism 21 comprises (FIGURE 6) a bellcrank lever 21b, the longer arm of which is connected to the solenoid 21a so that it is held back as the rear arms 35b extend through slots in the plates 34 in front of the spindle of the second bobbin 33.

4 On rocking again to the full extent of its clockwise movement the members 35 will release what was the second empty bobbin to the foremost position, any other bobbins in the machine also moving downwards by one spacing. The lower ends of the inclined plates 34 are disposed so that a released bobbin 33 will fall onto the cluster of shell rollers 25, 26, 27 as will later be described in more detail.

5 The bobbins 33 are arranged to rotate about their spindles, bearings being provided on the spindles. The permittor of the bobbins is preferably felt covered to enable the end of the lap to be picked up easily. Other arrangements could of course be provided for enabling the lap to be picked up, for example, a suction device could be provided within the bobbin.

6 Operatively disposed in relation to the cluster of shell rollers is the pair of cam plates 31, each of which has a guide surface 31a approximating to an Archimedian spiral and each having pivotally mounted thereon a lap release arm 36 and a stop 37 therefor. The relative dispositions of the guide surfaces 31a of cam plates 31, the cluster of shell rollers 25, 26, 27 and the arms 30, and the speed of rotation of the cluster and the individual rollers 25, 26, 27 are such that the spindle of a lap bobbin supported by a pair of shell rollers is constrained in such a manner during formation of the lap that the necessary load to ensure a tight lap is automatically and continuously applied.

7 One of the cam plates 31 also carries a spring loaded lever 38 adapted to be lifted against the action of spring 39 by each bar 30 as it passes and then returned against a stop 40 by the spring 39. On its return movement one end of the lever 38 operates a switch 41 which in turn temporally energises the two solenoids 21a, 32a, one for operating the mechanism 21 and the other for operating the empty bobbin release members 35 in the magazine.

8 Below the cam plates 31 lies 42 by means of which completed laps after formation and release are supported and conducted away under the influence of gravity from the left hand end of the machine.

9 The machine is driven from a single motor 43 disposed at the far side of the machine and not fully visible in the drawings, and conventional drive transmissions from the motor 43 are provided at that side of the machine for driving the lower of the pair of feed rollers 22, 23 (the top roller 22 being driven by its frictional contact with the web) and the individual rollers 25, 26, 27 of the cluster of rollers via gears 44, 45, 46, 47. At this side of the machine is also provided a drive between the drive roller 15 and rollers 12, 13, 14. A main driven shaft 48 extends across the machine and from it, through a double worm reduction gear 49 is driven a large chain wheel 50 associated with the cluster of rollers 25, 26, 27 by which the cluster is rotated bodily. The gear 44 is supported on a shaft 44a which extends across the machine and from this shaft 44a is transmitted, by conventional means, a drive to the mechanism 21.

10 Also from the main drive shaft 48 is derived, through idler gears 51, 52 and a gear wheel 53 on the end of rollers 15, a drive transmission to the drafting system. The drive is applied to the foremost bottom roller 15 and, as stated above, a drive connection is provided at the other side of the machine to the other rollers 12, 13, 14.

11 The manner of operation of the machine will now be described with reference to the drawings, and in particular with reference to FIGURES 3, 4 and 5 thereof.

FIGURE 3 illustrates the condition of the machine in which a lap is almost completely formed. The spindle of the bobbin of the lap has just reached the guide surfaces 31a and the ends of the spindle, and have begun to ride on the edges of lap release arms 36, which are tangential to the guide surfaces 31a. The bar 30 which is coming up to the vertical position has lifted the spring loaded lever 38 against the action of the spring 39.

12 As the cluster of shell rollers and the individual rollers 25, 26, 27 continue to rotate, the bar 30 first releases the lever...
38, which operates the switch 41. The operation of the switch causes, firstly, the solenoids 21a and 32a to be energised simultaneously, whereby the bar 19 is set in rotation in the manner hereinbefore described to cause a weakening of the oncoming web 18 and an empty bobbin 33 to be released from the magazine also as previously described. The bobbin falls onto the web 18 and severs it at the weak point and comes to rest between the shell rollers 25, 26 with its spindle bearing against the back of the bar 30. The new leading end of the web formed by the severance follows beneath the new bobbin 33 and is taken up thereby. Meanwhile, as the trailing end of the web formed by the severance passes from beneath the new bobbin 33 to complete the old lap, the spindle of the bobbin of the old lap reaches such a position relative to the release arms 36 that the latter are rotated to the limit allowed by the stop 37, this movement being sufficient to release the old lap and allow it to pass from its associated bar 30 onto the guide 42 to be conducted away. This is the position illustrated in FIGURE 4 and also in FIGURE 2, the release arms 36 having moved to their original positions under the influence of gravity.

As the new lap begins to rotate about its own axis under the influence of shell rollers 25, 26 and also to be bodily rotated about the axis of the cluster of shell rollers the guide surfaces 31a apply thereto, via its spindle, the necessary load to ensure the formation of a tight lap. An intermediate stage in the formation of the new lap is shown in FIGURE 5. Eventually the position illustrated in FIGURE 3 is reached again and the sequence of operations is repeated. The invention is not, of course, limited to the details of the embodiment just described, nor is it limited in application to the formation of laps. Other types of packages which could be formed by a machine incorporating the invention are, for example, cross wound silver packages at the front of a draw-frame, condenser roving packages, and the sliver lap packages.

In a further modification a lap may be formed on fixed rotatable shell rollers. In this case the load is applied by means of rotating cams. The mechanical arrangement is such that the cams make one revolution for each lap building cycle, or alternatively, a number of builds may be completed for one revolution of the cams.

At the completion of the lapping cycle the cam causes the full package to be lifted off the shell rollers thereby allowing an empty bobbin to be dropped onto the shell rollers. The full package is carried away in the manner above described.

We claim:

1. A machine for continuously forming and doffing laps and other packages on a support member having axial extensions, comprising a magazine adapted to carry a plurality of said support members, release means adapted on actuation to release a single support member from said magazine, a cluster of rollers rotatably supported on axes equispaced from each other and from a common axis of rotation for said cluster, drive means for rotating said cluster as a whole and the individual rollers thereof in such timed relationship as enables a full package to be wound onto a support member resting parallel to and between adjacent cluster rollers as said rollers move from a support feeding station to a doffing station, means associated with said cluster adapted to actuate said release means on successive pairs of cluster rollers reaching said feeding station, whereby a support member is fed thereto, means for severing the material of a fully formed package and causing it to be taken up by the new support member at the feeding station, cam means presenting rigid curved load-applying surfaces directly to said axial extensions of said support members between the feeding and doffing stations and terminating suddenly at the latter station whereby positively and rapidly to release the fully formed package from the cluster rollers.

2. A machine as set forth in claim 1 further comprising guide means for supporting and conducting away each fully formed package on release.

3. A machine as set forth in claim 1 in combination with a drafting system for attenuating fibrous web material and continuously feeding same to said machine for the formation of packages thereof.

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