ABSTRACT

At the delivery end of a bagmaking machine, upper and lower endless belt conveyors are arranged to run face to face over a common portion of their respective paths. The beginning of this portion provides a nip which receives the bottom end of each bag in turn as it is ejected from the surface of a rotating drum. The bags are conveyed between the conveyors through their common portion and are delivered therefrom downwardly to a delivery station at which they are arrested. The conveyors are run more slowly than the drum so that the bags, which are spaced apart around the drum, overlap each other in a continuous shingled form when they pass through the conveyors. Thus, when arrested at the delivery station they are easily into a stack or wad of bags.

5 Claims, 3 Drawing Figures
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1 BAGMAKING MACHINES

This invention relates to bagmaking machines.

In conventional bagmaking machinery, bags are made from a continuous web of sheet material of successive lengths of the web being cut off, folded and glued (although not necessarily in that order) to form the bags, which are then collected and formed into wads or stacks. In one commonly used form of bagmaking machine, in the last stage of the operation the bags, spaced apart in the direction of travel, are led bottom end first onto a large rotating drum. Axially extending gripping means on the drum grip the glued and folded-over bottom end portion of each bag in turn and cause it to be drawn around the drum. The bottom end portion is released and ejected (or "striped") from the drum at an ejection station, or point on the drum's periphery where the bag is moving downwards. The intention is that the bag should then fall away from the drum to a delivery station platform, where successive bags build up a horizontally extending stack.

This works well in practice at moderate delivery speeds with the smaller sizes of bag and with heavier grades of sheet material. Recently developed high-speed machines have however shown a serious problem, particularly with larger bags and with the lighter weights of sheet material, in that transverse folding and creasing tends to be produced periodically in bags being delivered to the stack.

Investigations have shown that this folding and creasing may be due to a variety of possible causes. Firstly, the sudden arresting of the bottom of the faster moving bag at the delivery station produces greater inertial forces in the remainder of the bag which may tend to cause flexing. Another possibility is that static electric or other adhesion produced between the bags and the drum prevent efficient release of the bags at high speeds. Various other factors may be involved, but the problem seems to be a function mainly of bag speed, bag length and material weight.

The present invention seeks to provide, in bagmaking machines, improvements such as tend to overcome the stated problem.

According to the present invention there is provided for a bagmaking machine, apparatus for collecting and stacking the bags, which includes upper and lower endless belt conveyors arranged to run face to face in the same direction and at the same speed over a common portion of their respective paths. The beginning of said common portion providing a nip between the conveyors located adjacent the ejection station of the drum of the bagmaking machine so as to receive the ejected bottom end portion of each bag in turn, the lower conveyor where it extends beyond the end of said common portion then being arranged to convey the bags downwardly to a delivery station, means being provided at the delivery station for arresting the bags and supporting a stack formed by successive delivery of the bags from the lower conveyor, the conveyors being capable of running at a speed sufficiently slower than the speed of the bags on the drum such that successive bags overlap each other on the conveyors.

Preferably, at least the lower conveyor comprises a plurality of endless bands running generally parallel to each other at the same speed. Behind the portion of the lower conveyor run leading down to the delivery station, suction means may be provided for holding the bags to the conveyor. In front of the portion of the lower conveyor run leading down to the delivery station suction means may be provided for drawing the trailing end portion of each bag away from the conveyor as the bag approaches the delivery station.

In order that the invention may be more clearly understood, a preferred embodiment will now be described with reference to the accompanying diagrammatic drawings, wherein:

FIG. 1 shows in side elevation a part of a bagmaking machine incorporating the improvement of the present invention,

FIG. 2 shows a section on the line II—II of FIG. 1, omitting the bag support fingers and transfer arms, and

FIG. 3 shows in longitudinal cross section the reciprocating arm mechanism.

Referring to the drawings, bags 10 are made in a conventional manner in the first part of the bagmaking machine (not shown) and are presented at the bottom end portion 12 leading to a large revolving drum 14. The folded-over and glued bottom end portion 12 of each bag is gripped in one of three axially extending gripping slots 16 provided in the drum 14. The slots 16 are equally spaced around the drum, and the distance between them is greater than the length of each bag. The drum revolves in the direction of the arrow A drawing each bag around until it is moving generally vertically downwards, when each gripping slot, on arriving at an ejection station 18, releases the bottom end portion 12 of its bag. Stripper tongues 20 are arranged at the ejection station; each stripper tongue sliding in a groove 21 in the drum, and having a ramp-shaped surface 22 which causes the end portion 12 of the bag to be stripped from the surface of the drum 14.

In previously known machines, a horizontal platform has been arranged at the ejection station to arrest the stripped bottom ends of the bags and support a horizontally extending stack formed by the ejection of successive bags. In the present embodiment however, the stripped end portions 12 are led by means of the ramp surfaces 22 of the stripper tongues 20 into a nip 24 formed between two continuously moving endless belt conveyors 26, 28.

The upper conveyor 26 comprises a pair of parallel conveyor bands 30 passing around four rollers 32, 33, 34 and 35. The lower conveyor 28 comprises three pairs of parallel conveyor bands 36. These bands 36 pass around four rollers 38, 39, 40, 41. The upper and lower conveyors are arranged to be driven at the same speed in the direction shown by the arrows B.

The belts of both conveyors 26, 28 pass over the rollers 32, 35, 39 and 40, thereby providing a common portion over which the conveyors run face to face in the same direction and at the same speed. The beginning of this common portion, where the two sets of belts converge, provides the nip 24 for receiving the bottom end portions 12 of the bags. The bags thus received are drawn between the two conveyors through this common portion.

The portion of the lower conveyor 28 extending beyond the end 46 of this common portion travels vertically downwards. Behind the lower conveyor in this portion there is located a grill 47 of vertical bars through which three endless bands 48 are arranged to apply suction through each of the three pairs of bands 36. The effect of this is that the bags emerging from the end 46 of the common portion of the conveyors are held by the suction to the lower conveyor bands.

Just below the suction ducts the bags are arrested at a delivery station. At the delivery station, a pair of parallel transfer arms 51 are hinged at 53 so as to be movable between a horizontal position, shown in full lines in FIG. 1, in which they extend through the lower conveyor between the bands 36, and a depending position, shown in broken lines in FIG. 1. Each transfer arm has a sliding upwardly cramped member 55, operated by a pneumatic cylinder 57 so as to cooperate with a fixed upstanding part 59 in providing on the arm a pair of jaws for gripping a stack or wad of bags. From the other side of the lower conveyor at the delivery station a pair of parallel reciprocating arms 61 are arranged for movement through the conveyor between the bands; this movement being linked to the pivotal movement of the transfer arms so that the reciprocating arms project through the conveyor when the transfer arms are removed from the horizontal position. Thus, the downwardly travelling bags are arrested and engagement of their leading ends 12 with either the sliding members 55 of the transfer arms or with the reciprocating arms 61, and a stack or wad 54 is built up. The stack is supported horizontally by resilient support fingers 50.

As shown in FIG. 3, each reciprocating arm comprises two relatively sidable parts 63 and 65. The lower part 65 has an upwardly cramped rear end portion 67 through which a screw
69 extends into the rear end of the upper part 63. The screw carries three nuts 71, by means of which, and in cooperation with the head 73 of the screw, the extent of relative sliding movement between the two parts can be accurately adjusted. The leading end of the upper part 63 is slotted at 75, and a claw 77 is pivoted at 79 in the slot. The claw has a depending tongue 81 which engages in a slot 83 in the lower part 65, so that relative sliding between the two parts causes movement of the claw between a retracted position, shown in full lines, and an extended position, shown in broken lines. A pinion 85 engages in a rack 87 formed on the underside of the part 65 for reciprocating the arm. Thus forward movement of the pinion firstly extends the claw and then moves the arm forward as a whole; reverse movement of the pinion from the forward position of the arm firstly retracts the claw and then withdraws the arm as a whole.

When the arms 61 are extended through the conveyor, the ends of the claws abut the existing stack of bags and cuts it off from the following bags which are then arrested by engagement with the upper parts 63 of the arms. The transfer arms, by operation of their pneumatic cylinders, have by this time gripped the lower end of the existing stack, and by pivoting downwardly withdraw the stack to a horizontal position on a continuously moving conveyor 89. The transfer arms move through a set of vertically reciprocating cranked fingers 91 arranged at the far side of the conveyor 89 so as to arrest and grip the stack and thus remove it from the grip of the transfer arms, which then return to the horizontal position to collect another stack.

The rate of travel of the conveyors 26, 28 is relatively slower than the rate of travel of the bags 10 in the bag making machine up to and including the drum 14. Thus, although the bags are spaced apart on the drum 14, as a result of their being slowed down on entering the nip 24 between the conveyors, they are caused to overlap to a considerable extent and form an unbroken shingled line of bags through the conveyors. For example, the conveyors may be run at rather less than half the speed of the rest of the machine so that successive bags overlap each other by about half their length. The advantages of this arrangement are that firstly, only a part of each bag is in contact with each conveyor, and the adhesive effect between bag and conveyor arising from any static electricity is proportionately reduced. Secondly, the overlapping of the bags prevents the bottom of one bag engaging the top of the preceding bag at the delivery station. In addition the area of one bag sliding over the next, the frictional effect of which may assist in causing the undesirable transverse flexing, is halved at each station, and the speed of relative sliding is also halved. Conveniently, the conveyors may be driven by gearing to the roller 14. The gearing may be adjustable so that the overlap of the bags can be controlled and different sizes of bags accommodated.

Since the trailing end portion of each bag overlaps the following bag, it will not be directly exposed to the suction of the ducts 48. An aproned roller 93 is arranged for rotation about a horizontal axis in front of the lower conveyor near the upper end of the stack of bags. Internally the roller is divided into two stationary compartments; a suction compartment 95 near the conveyor, and a blower compartment 97 remote from the conveyor. The roller rotates in the direction of the arrow C, and therefore the trailing end portion of each bag is sucked away from the conveyor and drawn around under the roller where it is then blown away from the roller. In this way, the bags are drawn away from the conveyor as they approach the delivery station, and this greatly helps in slowing them down and reducing their frictional and inertial forces on being arrested.

Further general advantages of the present invention may be stated as follows. The relatively slower speed of the conveyors reduces the inertial forces in the bags when they are arrested by the platform 52 at the delivery station. By providing conveyors consisting of parallel belts with relatively much larger spaces between them, the effect of static electric adhesion between the bags and conveyors is greatly reduced. The same effect might alternatively be produced by employing a single openwork web belt for at least the upper conveyor.

What I claim and desire to secure by Letters Patent is:

1. A bagmaking machine, apparatus for collecting and stacking the bags, which includes upper and lower endless belt conveyors arranged to run face to face in the same direction and at the same speed over a common portion of their respective paths, the beginning of said common portion providing a nip between the conveyors located adjacent the ejection station of the drum of the bagmaking machine so as to receive the ejected bottom end portion of each bag in turn, the lower conveyor where it extends beyond the end of said common portion being arranged to convey the bags downwardly to a delivery station, means being provided at the delivery station for arresting the bags and supporting a stack formed by successive delivery of the bags from the lower conveyor, the conveyors being capable of running at a speed sufficiently slower than the speed of the bags on the drum such that successive bags overlap each other on the conveyors.

2. Apparatus according to claim 1 wherein at least the lower conveyor comprises a plurality of endless bands running generally parallel to each other at the same speed.

3. Apparatus according to claim 1 wherein, behind the portion of the lower conveyor running leading down to the delivery station, suction means are provided for holding the bags to the conveyor.

4. Apparatus according to claim 1 wherein in front of the portion of the lower conveyor running leading down to the delivery station, suction means are provided for drawing the trailing end portion of each bag away from the conveyor as the bag approaches the delivery station.

5. Apparatus according to claim 1 wherein there are provided in the region of the delivery station first and second arms, each movable into and away from a position wherein it can arrest the bags and support the stack, the first arm being also adapted for gripping and removing the stack of bags, the movement of the two arms being linked so that when the first arm grips and removes a stack of bags the second arm arrests the following bags and supports them until the return of the first arm.

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