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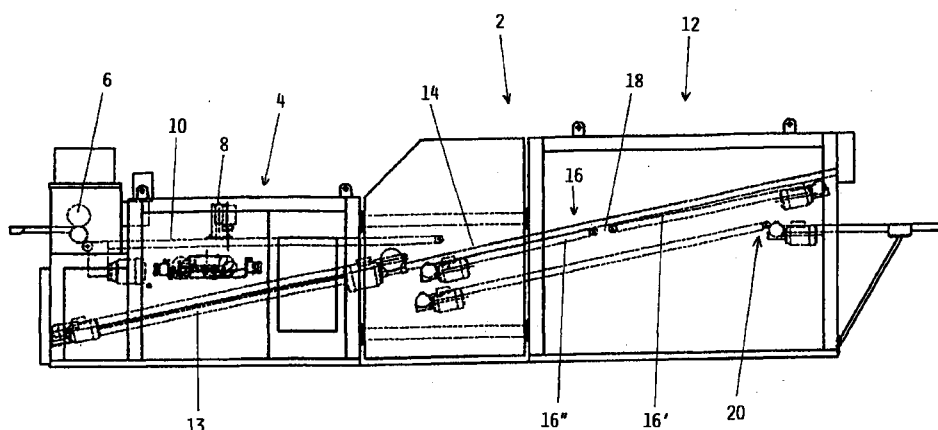
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(54) **Method and device for folding piles of sheets**

(57) A method for folding piles of flexible objects in sheet form, in particular skins, characterised by causing the pile of objects to descend progressively, starting from its central part, through a transverse gap (18) provided in the pile-forming belt conveyor (16), the pile,

which is folded into two parts as it descends, being collected on a moving underlying collection belt conveyor (20).



EP 1 076 101 A2

Description

[0001] This invention relates to a method for folding piles of flexible objects in sheet form, in particular skins, to form bunches, and a machine for implementing the method.

[0002] In the tanning industry, at a certain stage in the skin processing cycle it is known to position the skins one on another to form a pile, which is then folded into two or four parts, essentially to reduce their bulk and facilitate their packaging and transport. In this respect, the term "bunch of skins" generally means a pile of skins folded into two or four parts, depending on requirements.

[0003] Currently, to form a bunch of skins a pile is firstly formed on a conveyor belt using skins leaving an upstream machine, generally a measuring machine, and is then transferred onto an underlying moving collection belt. After one half of the length of the pile of skins has been deposited on the collection belt the direction of movement of this latter is reversed, so folding the second half of the pile onto the first half. If the piles is to be again folded, it is transferred onto a further collection belt, which is operated in the same manner as the preceding.

[0004] It will be apparent that with this method of operation, each folding passage is completed after the entire length of the pile of skins to be folded has passed beyond the edge of the upstream belt, to be collected on the downstream belt, this requiring a time which has to be added to the time normally set by the required working rate for forming the pile, and can never be reconciled with the need to achieve high production rates.

[0005] In addition, if the pile of skins has to be folded into four parts, the piles must firstly be folded into two parts, after which the pile already folded into two parts has to be again folded, with further working time increase.

[0006] In addition to these drawbacks encountered in the known process for folding piles of skins, further drawbacks are encountered in the machine which implement this known process.

[0007] One of these drawbacks is the large overall size of the machine, which besides comprising a skin pile-forming belt conveyor, of length at least equal to the maximum length of the skins to be piled, it must also comprise a collection belt conveyor by a distance at least equal to one half the maximum length of the skins.

[0008] If the pile of skins is to be folded into four parts, a further drawback arises in that a second collection belt conveyor is required, with evident increase in the overall size and constructional complexity of the machine.

[0009] According to the invention all these drawbacks are eliminated through a method for folding pile as described in claim 1.

[0010] The invention also foresees a machine as described in claim 4.

[0011] A preferred embodiment of the invention is described in detail hereinafter by way of non-limiting example with reference to the accompanying drawing, showing a longitudinal schematic section through a folding machine according to the invention associated with a skin measuring machine.

[0012] As can be seen from the drawing, for clarity of description the folding machine of the invention, indicated overall by 2, is shown downstream of a further skin processing machine, indicated overall by 4 and consisting in the illustrated example of a traditional measuring machine comprising a series of skin surface measurement rollers 6, a stamper 8 for stamping the resultant measurement, and an exit belt conveyor 10.

[0013] The folding machine 2 comprises, on a fixed frame 12, an auxiliary belt conveyor 14 with its belt drivable in both directions relative to its support structure, which can traverse longitudinally to the frame 12, along guides 13 provided on the frame of the measuring machine 4, between an advanced position in which it totally projects beyond the exit conveyor 10 of said measuring machine 4, and a retracted position in which it lies below said conveyor 10.

[0014] The frame 12 of the folding machine 2 also supports, for forming the pile of skins, a belt conveyor 16 consisting of two mutually aligned portions 16' and 16" spaced apart to define between them a transverse gap 18 of width at least equal to double the maximum height of the pile of skins to be formed. The two portions 16' and 16" of the forming conveyor 16 are fixed, in the sense of not being able to traverse, relative to the folding machine frame 12 and support two belts driven in opposite directions drivable forward the gap 18. The two belts are preferably in both directions in order to increase the range of performance obtainable by the machine, although for pile folding purposes it is sufficient for the belts of the two portions 16' and 16" of the forming conveyor 16 to be able to be driven with simultaneous opposing advancement.

[0015] To be able to rearwardly support particularly lengthy skins without increasing the overall space requirement of the folding machine 2, that end part of the portion 16" closer to the measuring machine 4 is preferably hinged to the remaining part and can pass from a position coplanar with it to a downwardly rotated position (see drawing).

[0016] In a position below the forming conveyor 16 the frame 12 supports a collection belt conveyor 20. This comprises a structure fixed relative to the frame 12 and a belt drivable in both directions of advancement. The fixed structure of the collection conveyor 20 has a length substantially equal to the total length of the forming conveyor 16, but is located within the frame 12 in a slightly more advanced position, so that its downstream end projects beyond said forming conveyor 16.

[0017] In a different embodiment, not shown on the drawing, the collection conveyor 20 has a length less than, but equal to at least one half of, the overall length

of the forming conveyor 16, its structure being able to traverse longitudinally relative to the support frame 12 in a manner such that a portion of said conveyor always faces the gap 18 defined by the two portions 16' and 16" of the forming conveyor 16.

[0018] The folding machine of the invention operates in the following manner: The skins leaving the measurement rollers 6 of the measuring machine 4 are collected by its exit conveyor 10 which transfers them to the auxiliary conveyor 14 which, by the effect of its traversing movement and belt advancement, form the pile of skins in traditional manner on the forming conveyor 16 in the desired mutual arrangement.

[0019] When the pile of skins has been formed with its central part lying over the gap 18, a simultaneous command for simultaneously advancing the belts of the two portions 16' and 16" in opposite direction is fed, so that these urge the pile into the gap 18 and cause it to fall through the gap onto the underlying collection conveyor 20 while simultaneously undergoing transverse folding into two parts. At the same time, driving the belt of the collection conveyor 20 causes the pile to deposit on it folded into two parts.

[0020] If the pile is to be folded into four, it is sufficient to reverse the direction of advancement of the collection conveyor 20 during the middle of its deposition stage, to cause the second part of the pile, which is already folded into two during its descent through the gap 18, to fold onto its first part already deposited on the conveyor 20.

[0021] The pile of skins folded into two or four can also be deposited onto the conveyor 20 by simply causing the belt support structure of the collection conveyor 20 to traverse in one of both directions without driving its belt. However this embodiment would appear less advantageous than the preceding in that the conveyor 20 still has to be provided with belt drive means to enable the bunch of skins, ie the folded pile, to be discharged downstream.

[0022] Whatever the embodiment used, the method of the invention is very advantageous compared with traditional methods, and in particular:

- it folds the pile of skins into two parts in half the time previously required, other conditions being equal,
- it folds the pile of skins into four parts in substantially no longer than the time required for folding it into two parts.

[0023] The folding machine of the invention is also very advantageous compared with traditional machines, and in particular:

- it is of substantially lesser overall size than traditional machines, in that the folded pile collection conveyor is totally contained within the outline of the forming conveyor, and also enables the space below the measuring machine to be used for the

auxiliary conveyor and/or the skin pile-forming conveyor, with reduction in the overall size of the processing line.

- it substantially reduces the time required for folding the piles of skins,
- using a suitable control program, it enables just one of the two portions of the pile forming conveyor to be used in the case of half-sized or small skins, so properly adapting working times to skin dimensions.

Claims

1. A method for folding piles of flexible objects in sheet form, in particular skins, characterised by causing the pile of objects to descend progressively, starting from its central part, through a transverse gap (18) provided in the pile-forming belt conveyor (16), the pile, which is folded into two parts as it descends, being collected on a moving underlying collection belt conveyor (20).
2. A method as claimed in claim 1, characterised by feeding the two halves of the pile of objects towards the transverse gap (18), through which it descends onto the underlying collection conveyor (20).
3. A method as claimed in claim 1, characterised in that after one half of the pile already folded into two parts has deposited on the moving collection conveyor (20), the direction of movement of said conveyor is reversed.
4. A machine for implementing the method claimed in one or more of claims 1 to 3, with a belt conveyor (16) for forming the pile of objects originating from an upstream processing machine (4) and with a belt conveyor (20) for collecting the folded pile, characterised in that the pile forming conveyor (16), is formed from portions (16', 16'') spaced apart by a distance at least equal to double the maximum thickness of the pile to be formed and each supporting a belt driven towards the gap (18) defined by said portions (16', 16''), said collection conveyor (20) being provided in a position below said gap (18).
5. A machine as claimed in claim 4, characterised in that the belt of the collection conveyor (20) is drivable in both directions of advancement.
6. A machine as claimed in claim 4, characterised in that the two portions (16', 16'') constituting the forming conveyor (16) for the pile of objects can concordantly and simultaneously traverse in the longitudinal direction between a retracted position lying below the exit belt conveyor (10) of the upstream processing machine (4) and an advanced

position projecting beyond said exit conveyor (10).

7. A machine as claimed in claim 6, characterised in that when in its most retracted position the upstream end of the upstream portion (16") of the forming conveyor (16) lies in proximity to the upstream edge of the upstream processing machine (4). 5
8. A machine as claimed in claim 4, characterised by comprising an auxiliary belt conveyor (14), interposed between the exit conveyor (10) of the upstream processing machine (4) and the forming conveyor (16) for the pile of objects, said auxiliary conveyor (14) being able to traverse longitudinally between an advanced position projecting from said exit conveyor (10) and overlying said formation conveyor (16) for said pile of objects, and a retracted position below said exit conveyor (10). 10 15 20
9. A machine as claimed in claim 8, characterised in that when in its most retracted position the upstream end of the auxiliary conveyor lies in proximity to the upstream edge of the upstream processing machine. 25
10. A machine as claimed in claim 1, characterised in that the upstream end part of the upstream portion (16") of the forming conveyor (16) for the pile of objects is hinged to the remaining part and is rotatable downwards. 30
11. A machine as claimed in claim 4, characterised in that the collection conveyor (20) can traverse longitudinally, its belt being drivable at least in its advancement direction. 35

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