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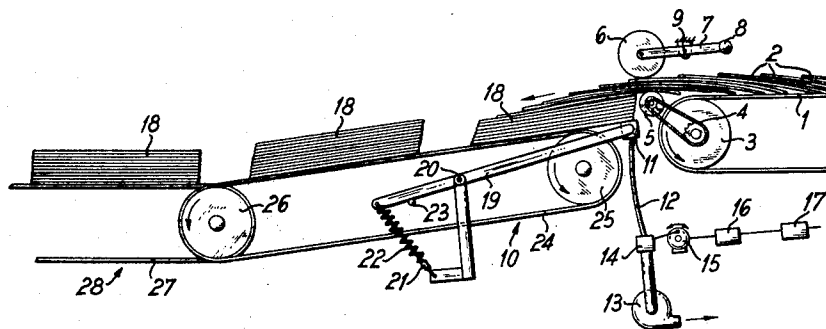
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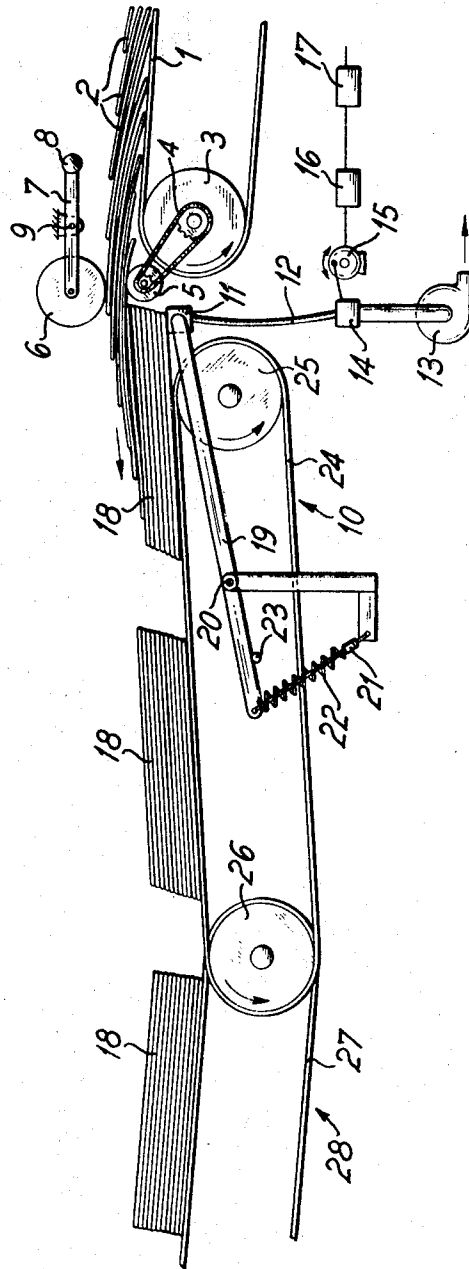
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[54] **BUNDLING APPARATUS FOR FLATTENED TUBE SECTIONS COMING FROM A TUBE-MAKING MACHINE**
10 Claims, 1 Drawing Fig.

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[50] Field of Search 93/93 DP;
214/6 D; 271/46, 86; 198/35

ABSTRACT: A bundling apparatus for flattened tube sections coming from a tube making machine comprising a first conveyor for depositing the tube sections thereon in an overlapping scale formation followed by a continuously movable endless second conveyor for bundling the tube sections. The first conveyor is passed over a direction changing roller at the delivery end of the first conveyor adjacent a receiving end of the second conveyor. A suction beam is disposed between the delivery end of the first conveyor and the receiving end of the second conveyor with the suction beam being adapted to have its suction effect interrupted after a bundle of a predetermined number of tube sections has been formed. A rotatable supporting roller for the tube sections having a smaller radius than the direction changing roller is positioned parallel to the direction of the changing roller and is disposed between the suction beam and the delivery end of the first conveyor.





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BUNDLING APPARATUS FOR FLATTENED TUBE SECTIONS COMING FROM A TUBE-MAKING MACHINE

The invention relates to a bundling apparatus for flattened tube sections coming from a tubemaking machine, for example flattened tube sections of flexible plastics material to be used in making sacks or bags.

It is already known to provide at the outlet of a tubemaking machine a first conveyor band on which the tube sections are deposited in an overlapping scale formation, followed by a continuously moving endless second conveyor band for bundling the tube sections thereon, a suction beam which is adapted to have its suction effect terminated after a bundle of a predetermined number of tube sections has been formed being provided upstream of the receiving end of the second conveyor band. The function of the suction beam is to engage and hold a tube section that is to constitute the lowermost tube section of a stack that is to be formed on the second conveyor and onto which the other tube sections of the stack are successively deposited. At the instant that the suction effect of the suction beam is interrupted, the formed stack or bundle is released and is pulled away by the constantly moving second conveyor. Thereafter, the suction effect of the suction beam is reestablished whereby the next tube section arriving from the tubemaking machine is again held stationary so that a new bundle or stack is formed thereon.

Since the suction beam is located between the delivery end of the first conveyor and the receiving end of the second conveyor, there is a relatively long path which has to be bridged by the tube sections and over which they are transported only under the action of the friction between superjacent tube sections. However, since the tube sections on the one hand undergo a strong braking effect during stacking and on the other hand cannot be given a sufficiently strong impetus by the first conveyor, the stack that is formed on the second conveyor may still show some marked overlapping and may need to be straightened in a subsequent operation so that all the tube sections of the stack are properly aligned. Further, and this applies particularly to tube sections which have very little stiffness such as double-layer sections of so called Clupak paper, the tube sections may become buckled and clog up at the transition between the two conveyors and thereby interfere with the continuous production sequence.

The invention aims to provide a bundling apparatus which facilitates the formation of accurately aligned stacks of tube sections.

According to the invention, a bundling apparatus for flattened tube sections coming from a tubemaking machine comprises a first conveyor for depositing the tube sections thereon in overlapping scale formation followed by a continuously movable endless second conveyor for bundling the tube sections thereon, said first conveyor being passed over a direction-changing roller at a delivery end of said first conveyor adjacent a receiving end of said second conveyor, a suction beam disposed between the said delivery end of said first conveyor and the said receiving end of said second conveyor, said suction beam being adapted to have its suction effect interrupted after a bundle of a predetermined number of tube sections has been formed, and a rotatable supporting roller for said tube sections disposed between said suction beam and said delivery end of said first conveyor, said supporting roller being parallel to said direction-changing roller and having a smaller radius than same.

As a result of the smaller radius of curvature of the supporting roller, the so-called "dead" path that needs to be bridged between the suction beam and the position where each tube section is released by the first conveyor at the direction-changing roller is reduced. Since the tube sections will now be supported for as long as possible, the stacks that are ultimately formed will be reasonably accurately aligned without showing any marked overlapping of the individual tube sections of the stack and it is also possible to avoid clogging of the individual tube sections.

A pressure roller may be provided above the supporting roller so as to minimize slip between each tube section and the supporting roller and ensure that each tube section is subjected to conveying movement for as long as possible. Further, it is advantageous for the supporting roller to be power driven, preferably at a peripheral speed which is substantially the same as the speed of the first conveyor, so as to convey the tube sections positively and uniformly until they are released by the supporting roller. The latter can be provided with a covering of rubber or the like to reduce slip between the tube sections and the supporting roller to a minimum.

According to another aspect of the invention which may be used independently of the aforementioned feature of a supporting roller, the suction beam can be depressible against the influence of a spring or springs. This has the advantage that the suction beam will ascend as soon as a stack of tube sections has been carried away on the second conveyor and therefore the suction beam will come towards the next tube section that is to form a new stack and immediately engage same. Without this feature, i.e. if the suction beam is fixed in position, it might happen that the first and an occasional subsequent tube section shoots past the suction beam, in which case the stacks will not contain tube sections of the predetermined number. The spring characteristic of the or each spring is preferably such that the spring elongation corresponds to the weight of tube sections on the suction beam in such a way that the uppermost tube section is always deposited on the stack at a substantially constant level. It is also advantageous if the movement of the depressible suction beam is limited by stops so as to prevent the tube sections from striking the suction beam as they are being conveyed.

According to a still further aspect of the invention which, again, is applicable independently of the aforementioned features, the second conveyor is inclined from its receiving end down to its discharge end. This facilitates sliding of the tube sections onto one another during stacking against frictional resistance.

An example of the invention is illustrated in the accompanying drawing which is a diagrammatic side elevation of a bundling apparatus. A conveyor 1 which passes over a direction-changing roller 3 at its delivery end is driven at a speed governed by the output speed of a tubemaking machine (not shown) so that it will convey tube sections 2 in an overlapping scale formation from the outlet of the machine. A supporting roller 5 is driven by the conveyor 1 through a chain drive 4 at a peripheral speed corresponding to the speed of the conveyor 1. To avoid slip between the flattened tube sections 2 and the supporting roller 5, provision is made for a pressure roller 6 which is carried by lever arms 7 that are freely pivotable on a shaft 9 and that also carry a counterweight 8.

With the aid of the supporting roller 5, the tube sections 2 are pushed onto a conveyor 10 on which they are formed into stacks. The conveyor 10 is inclined to facilitate sliding of the tube sections onto one another and it moves continuously. Between the conveyor 10 and the supporting roller 5 there is a suction beam 11 which is connected to a suction pump 13 through a conduit 12. The conduit contains a control valve 14 which can be actuated by a pulse generator 16 through a servomotor 15. The pulse generator 16 is set to a predetermined number of tube sections that is desired to be contained in each stack and it receives counting pulses from a counting mechanism 17 of the tubemaking machine. When the predetermined desired number of tube sections has been attained, i.e. when a stack 18 has been completed, the suction effect of the suction beam 11 is interrupted for a short period by means of the control valve 14. At this instant the finished stack 18 is released by the suction beam and carried along by the conveyor 10. The suction beam 11 is carried by levers 19 that are pivotable about a shaft 20 and that are subjected to the influence of a spring 22 which is adjustable by means of a set screw 21. During formation of a stack, the suction beam 11 is successively depressed under the weight of the arriving tube sections 2 against the influence of the spring 22. As soon as a completed stack has been carried away by the conveyor 10,

the suction beam will ascend under the action of the spring 22 until the levers 19 strike a stop 23. In the meantime, the suction conduit 12 had been opened again so that the trailing end of the next tube section arriving from the conveyor 1 is engaged and held by the suction beam 11. This trailing end falls onto the suction beam immediately it leaves the supporting roller 5 and thus the tube section can be engaged by the suction beam only at this trailing end. Subsequent tube sections slide onto the tube section that is being held by the suction beam to form a new stack 18. When the predetermined desired number has been reached again, the previously described procedure is repeated.

The conveyor 10 comprises a plurality of spaced belts 24 which pass over direction-changing rollers 25 and 26. The spacing between adjacent belts 24 is such that individual belts 27 of a discharge conveyor 28 can be located in the spaces and likewise be passed over the direction-changing roller 26.

We claim:

1. Bundling apparatus for flattened tube sections coming from a tubemaking machine, comprising a first conveyor for depositing the tube sections thereon in overlapping scale formation followed by a continuously movable endless second conveyor for bundling the tube sections thereon, said first conveyor being passed over a direction-changing roller at a delivery end of said first conveyor adjacent a receiving end of said second conveyor, a suction beam disposed between the said delivery end of said first conveyor and the said receiving end of said second conveyor, said suction beam being adapted to have its suction effect interrupted after a bundle of a predetermined number of tube sections has been formed, and a rotatable supporting roller for said tube sections disposed between said suction beam and said delivery end of said first conveyor, said supporting roller being parallel to said direction-changing roller and having a smaller radius than same.

2. Bundling apparatus according to claim 1, including a pressure roller disposed above the supporting roller.

3. Bundling apparatus according to claim 1, wherein the supporting roller is power driven.

4. Bundling apparatus according to claim 3, wherein the supporting roller is driven at a peripheral speed substantially equal to the speed of said first conveyor.

5. Bundling apparatus according to claim 1, wherein the

supporting roller is provided with a covering of rubber or the like.

6. Bundling apparatus for flattened tube sections coming from a tubemaking machine, comprising a first conveyor for depositing the tube sections thereon in overlapping scale formation followed by a continuously movable endless second conveyor for bundling the tube sections thereon, said first conveyor being passed over a direction-changing roller at a delivery end of said first conveyor adjacent a receiving end of said second conveyor, and a suction beam disposed between the said delivery end of said first conveyor and the said receiving end of said second conveyor, said suction beam being adapted to have its suction effect interrupted after a bundle of a predetermined number of tube sections has been formed, preferably in accordance with any preceding claim, wherein the suction beam is depressible against the influence of a spring or springs.

7. Bundling apparatus according to claim 6, wherein the spring characteristic of said spring or springs is such that the spring elongation corresponds to the load on the suction beam in such a way that the uppermost tube section is always deposited at a substantially constant level.

8. Bundling apparatus according to claim 6, wherein the movement of the said depressible suction beam is limited by stops.

9. Bundling apparatus according to claim 7, wherein the movement of the said depressible suction beam is limited by stops.

10. Bundling apparatus for flattened tube sections coming from a tubemaking machine, comprising a first conveyor for depositing the tube sections thereon in overlapping scale formation followed by a continuously movable endless second conveyor for bundling the tube sections thereon, said first conveyor being passed over a direction-changing roller at a delivery end of said first conveyor adjacent a receiving end of said second conveyor, and a suction beam disposed between the said delivery end of said first conveyor and the said receiving end of said second conveyor, said suction beam being adapted to have its suction effect interrupted after a bundle of a predetermined number of tube sections has been formed, preferably in accordance with any preceding claim, wherein the said second conveyor is inclined from the said receiving end down to a discharge end thereof.

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