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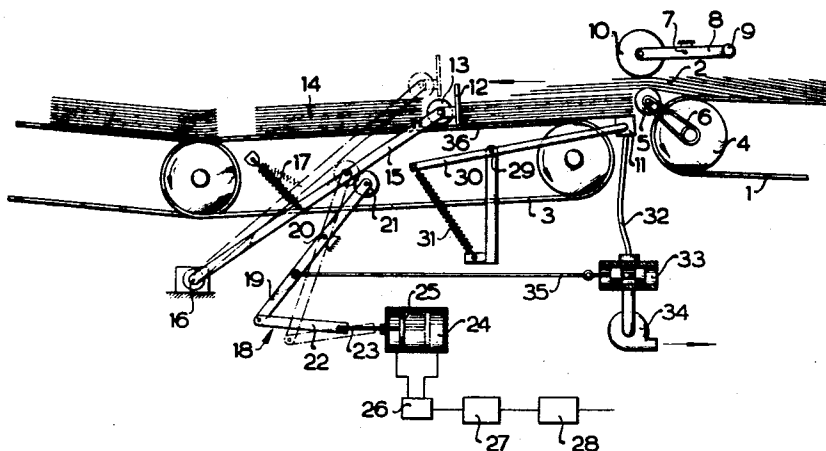
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[54] **BUNDLING APPARATUS FOR FLATTENED TUBE SECTIONS MADE BY A TUBE-MAKING MACHINE**
8 Claims, 2 Drawing Figs.

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ABSTRACT: A bundling apparatus for flattened tube sections coming from a tube making machine comprising a first conveyor for depositing the tube sections from the machine thereon in an overlapping scale formation followed by a continuously movable second conveyor for transporting the tube sections after they have been formed into bundles. A suction beam engages and holds the lowermost tube section of each bundle on the second conveyor and is adapted to have its suction effect interrupted after each bundle has been formed with a predetermined number of tube sections. A substantially vertical abutment plate for the tube sections has its bottom edge disposed immediately above the conveying run of the second conveyor during formation of each bundle and is adapted to be raised after the formation of each bundle.



BUNDLING APPARATUS FOR FLATTENED TUBE SECTIONS MADE BY A TUBE-MAKING MACHINE

The invention relates to a bundling apparatus for flattened tube sections made by a tubemaking machine.

It is already known to provide tubemaking machines with a first conveyor on which the tube sections from the machine are deposited in overlapping scale formation, followed by a continuously moving second conveyor on which the tube sections are to be formed into bundles or stacks, the lowermost tube section of each bundle or stack being held on the second conveyor by a suction beam which is adapted to have its suction effect interrupted after each bundle or stack has been formed. The suction beam holds the lowermost tube section stationary on the second conveyor so that it is not carried away by the second conveyor and so that subsequent tube sections delivered by the first conveyor are stacked thereon. Only at the instant when the suction effect is interrupted will the lowermost tube section and hence the formed stack be released to be transported away by the constantly moving second conveyor. The suction effect is then reestablished and the next tube section arriving from the first conveyor will again be held stationary to form a new stack.

With such apparatuses, the successively arriving tube sections are often irregularly deposited on the lowermost section that is held by the suction beam. In particular, difficulties arise as regards the distribution of the tube sections at the time a completed stack is being moved away by the second conveyor and a new stack is being started simultaneously. It may occur that the last few tube sections for the old stack remain clinging to under the first tube section that is to form the new stack and that has already been engaged by the suction beam. The weight of the tube sections that are being piled on this first tube section of the new stack will then prevent the last few sections of the old stack from being carried away by the second conveyor or they are carried away so much later that they will not be properly aligned on the old stack. For this reason, the lower and upper layers of the stacks are often very untidy so that each stack must be straightened in a subsequent manual operation and one cannot be certain that each stack contains a predetermined constant number of tube sections.

The invention aims to provide a bundling or stacking apparatus which minimizes the above-mentioned disadvantages, is more likely to form accurately aligned stacks containing a constant number of tube sections and almost entirely avoids the need for subsequent manual straightening of the stacks.

According to the invention, bundling apparatus for flattened tube sections coming from a tubemaking machine comprises a first conveyor for depositing the tube sections from the machine thereon in overlapping scale formation followed by a continuously movable second conveyor for transporting the tube sections after they have been formed into bundles thereon, a suction beam for engaging and holding the lowermost tube section of each bundle on said second conveyor and adapted to have its suction effect interrupted after each bundle has been formed with a predetermined number of tube sections, and a substantially vertical abutment plate for the tube sections of which the bottom edge is disposed immediately above the conveying run of said second conveyor during formation of each bundle and which is adapted to be raised after formation of each bundle. The tube sections arriving from the first conveyor can now strike the abutment plate and have its edges properly aligned to form a clean stack. The abutment plate is also of advantage insofar as any tube section that does not belong to a completed stack which is being transported away but is inadvertently propelled towards same will be stopped by the abutment plate for engagement by the suction beam to form a new stack.

The abutment plate may be fixed to levers pivoted about an axis disposed below the conveying run of the second conveyor. This facilitates rapid release of a completed stack by the abutment plate without hindering removal of the

completed stack by the second conveyor. Actuating means for the abutment plate are preferably coupled to a control valve in a suction conduit for the suction beam so that, when the suction effect is interrupted, the abutment plate is simultaneously lifted. Further, the actuating means may be controllable by a tube-section counter of the tubemaking machine.

To permit rapid lifting and lowering of the abutment plate, the levers to which it is fixed may be provided with counterweights or countersprings. It is of particular advantage if the back of the abutment plate is provided with a pressure roller. As soon as a finished stack has been released and is still located beneath the abutment plate, the latter comes to lie on the moving finished stack together with its pressure roller so that the uppermost tube sections of the finished stack that might still be clinging to beneath the subsequent tube sections for the next stack are reliably carried away together with the old stack whilst the said subsequent tube sections are being held back. Hitherto it has been found that the uppermost tube sections are pulled off the finished stack under the friction between them and the undermost tube section of the next stack that has already been engaged by the suction beam.

The second conveyor may have an inclination of at least 5° to the horizontal in the direction of conveying. This facilitates superpositioning of the tube sections on the second conveyor because every tube section is more likely to slide towards the abutment plate to form a stack that has its edges properly aligned.

An example of the invention is illustrated in the accompanying diagrammatic drawings, wherein:

FIG. 1 is a side elevation of a bundling or stacking apparatus showing the abutment plate in its lowered position in full lines and in a raised position in chain-dotted lines, and

FIG. 2 is a similar view of the FIG. 1 apparatus showing a completed stack of tube sections about to be transported away.

A conveyor 1 of a tubemaking machine (not shown) has tube sections 2 deposited on it in overlapping scale formation and serves to convey the tube sections to a conveyor 3. The conveyor 1 is passed over a direction-changing roller 4 at its delivery end. This roller 4 serves to drive a transporting roller 5 through a chain drive 6 so that the peripheral speed of the roller 5 is the same as the speed of the conveyor 1 and the tube sections 2 are positively conveyed towards the conveyor 3 for as long as possible. A pressure roller 10 carried by a lever 8 which is pivotable about a shaft 7 and also carries a counterweight 9 for adjusting the pressure of the roller 10 is provided to avoid slip between the transporting roller 5 and the tube sections 2.

The trailing end of the lowermost tube section for each stack to be formed on the conveyor 3 is held stationary by a suction beam 11. Subsequent tube sections pile up thereover and strike an abutment plate 12 which is adjustably spaced from the suction beam 11 by a distance corresponding to the lengths of the tube sections 2. At the back of the abutment plate 12 there is a pressure roller 13 which rolls over a completed stack 14 when it and the abutment plate 12 are elevated. The plate 12 and roller 13 are mounted on levers 15 which are pivotable about a shaft 16 engaged by counterbalancing springs 17. Actuating means 18 are provided to operate the abutment plate 12. These actuating means comprise levers 19 which are pivotable about a shaft 20 and carry at one end rollers 21 which lie against the levers 15, the other ends of the levers 19 being connected through a traverse to a guide bar 22 which, in turn, is connected to a piston rod 23 of a piston 25 in a pneumatic cylinder 24. A magnetic valve 26 which responds to impulses from an impulse generator 27 actuates reciprocation of the piston 25 in the cylinder 24 so as to operate the abutment plate 12 through the linkage as just described. The impulse generator 27 is set to the number of tube sections to be contained in each stack. In addition, the impulse generator 27 receives counting pulses from a tube-section counting mechanism 28 of the tubemaking machine. When a predetermined number of desired tube sections for

each stack has been reached, i.e. when the predetermined number of impulses has been received by the impulse generator 27 from the counting mechanism 28 of the tubemaking machine, the impulse generator 27 delivers a pulse to the magnetic valve 26.

The suction beam 11 is secured to a lever 30 that is pivotable about a shaft 29 and that is provided with a spring 31. A suction conduit 32 connects the beam 11 to a suction pump 34 and contains a control valve 33 by means of which the suction effect can be interrupted. The control valve 33 is operated through linkage 35 connected to the lever 19.

The apparatus operates as follows. The impulse generator 27 may receive 10 pulses from the counting mechanism 28 before it delivers a pulse to the magnetic valve 26, in which case each stack that is to be formed will contain 12 tube sections. The valve 26 controls the compressed air in the cylinder 24 so that the piston 25 is displaced towards the right-hand side as viewed in FIG. 1. By means of the linkage the abutment plate 12 is thereby raised to the position shown in chain-dotted lines in FIG. 1 and at the same time the suction effect of the suction beam 11 is interrupted by means of the linkage 35 and the control valve 33. At this instant a completed stack 14 is transported away by the conveyor 3 and, by a reverse movement of the piston 25, the plate 12 and pressure roller 13 are placed on the completed stack, the suction beam 11 having in the meantime been raised under the influence of the spring 31 and the suction effect having been reestablished (see FIG. 2). By pressing on the completed stack 14, the pressure roller 13 ensures that the uppermost tube sections are not pulled off the completed moving stack 14 by any of the subsequent tube sections that happen to lie thereover, these subsequent tube sections striking the abutment plate 12. The completed stack 14 therefore remains undisturbed and, as soon as it has been moved from beneath the plate 12 and roller 13, both of the latter will be returned towards the conveying run 36 of the conveyor 3.

I claim:

1. Bundling apparatus for flattened tube sections coming from a tubemaking machine, comprising a first conveyor for depositing the tube sections from the machine thereon in overlapping scale formation followed by a continuously movable second conveyor for transporting the tube sections after they have been formed into bundles thereon, a suction beam for engaging and holding the lowermost tube section of each bundle on said second conveyor and adapted to have its suction effect interrupted after each bundle has been formed with a predetermined number of tube sections, and a substantially vertical abutment plate for the tube sections of which the bottom edge is disposed immediately above the conveying run of said second conveyor during formation of each bundle and which is adapted to be raised after formation of each bundle.

2. Apparatus according to claim 1, wherein the abutment plate is fixed to levers pivoted about an axis disposed below the conveying run of said second conveyor.

3. Apparatus according to claim 1, wherein actuating means for the abutment plate are coupled to a control valve in a suction conduit for the said suction beam.

4. Apparatus according to claim 3, wherein said actuating means are controllable by a tube-section counter of the tubemaking machine.

5. Apparatus according to claim 2, wherein the said levers are provided with counterweights or countersprings.

6. Apparatus according to claim 1, wherein a pressure roller is provided at the back of the abutment plate.

7. Apparatus according to claim 1, wherein the said second conveyor is inclined at least 5° to the horizontal in the conveying direction.

8. Apparatus according to claim 2, wherein actuating means for the abutment plate are coupled to a control valve in a suction conduit for the said suction beam.

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