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2,805,757

NEWSPAPER CONVEYORS

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Application October 31, 1955, Serial No. 543,939

10 Claims. (Cl. 198—35)

This invention relates to newspaper conveyors and has for its object the provision of means whereby the newspapers, while on the conveyor may be stacked into batches.

The invention consists broadly of a newspaper conveyor system in which a succession of groups of overlapping papers are conveyed on a horizontal belt conveyor with spaces between the adjacent groups, wherein, as each group reaches a given position, two barrier elements are moved laterally into the path of the papers, one before and the other behind such group, and are then moved towards one another so as to cause the overlapping papers to slide together and form a stack.

In order that the invention may be the more clearly understood a system in accordance therewith will now be described reference being made to the accompanying drawings wherein:

Figure 1 is a somewhat diagrammatic side elevation of the system shown immediately prior to the commencement of a stacking operation;

Figure 2 is a similar view of the system shown after the first step in the stacking operation;

Figure 3 is a similar view of the system shown at the end of said stacking operation;

Figure 4 is an end elevation of one of the parts of the system;

Figure 5 is an electric circuit diagram illustrating electrical control circuits whereby the stacking operations are controlled automatically.

Referring to the drawings the papers 1 are conveyed from the press, on a horizontal endless belt conveyor 2, in a series of spaced quires. That is to say one quire of papers in overlapping formation is followed by a short gap of no papers, which is followed by another quire and so on.

In the present arrangement, as soon as a quire reaches a given position—viz the position of the leading quire in Figure 1—a horizontal frame 3, which is located underneath the conveyor and which carries two upstanding forked blades 4 and 5 (see also Figure 4) in spaced relation along the conveyor, is raised to the position of Figure 2 so that said two forked blades pass upwards between the belts of the conveyor, the arrangement being such that one of said blades, viz the blade 4 (hereinafter called the front blade) comes in front of the quire and the other, the blade 5 (hereinafter called the rear blade) behind it. When the frame 3 is at its fully up position it stops and the front blade 4 remains stationary. The rear blade 5 is now moved horizontally forwards relative to said frame, until it is separated from the front blade 4 only by the distance of one paper length as shown in Figure 3, and it will thus be seen that the overlapping papers of the quire are slid on top of each other until they form a vertical stack located between the two vertical blades 4 and 5.

When the rear blade 5 reaches its foremost limit, the frame 3 is lowered together with its blades and the rear blade 5 is returned rearwardly to its starting position, and all is ready for a repetition of the operation when

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the next quire reaches said given position. It will thus be seen that the quires are formed into a series of spaced vertical stacks which are conveyed along by the conveyor to a point of delivery.

For effecting the up and down movement of the frame 3, the same is mounted by means of a bracket 6 on the upper end of a vertical piston rod 7 whose lower end is secured to the piston of an air cylinder 8. Each time a quire reaches the said given position of Figure 1, a light beam 9 is permitted to pass from a source of light 10 through the gap immediately behind said quire and to impinge upon a photoelectric device 11, and said photoelectric device thereupon (see Figure 5) completes a circuit through the winding RW of a relay, said circuit being traced from one mains terminal L1, through pole M1 of manually operated main switch, through said photoelectric device 11, through said relay winding RW, through a normally closed mechanically operated contact C1, and through the other pole M2 of the main switch to the other mains terminal L2.

Said relay therefore closes main contacts R1 and auxiliary contacts R2. Closure of said auxiliary contacts R2 establishes a maintaining circuit for said winding RW as will be immediately clear from the drawing.

Closure of the main relay contacts R1 establishes an energising circuit for a solenoid S1, and this operates a valve (not shown) which allows compressed air to enter the lower end of the cylinder 8 by way of a conduit 12, and to exhaust from the upper end of said cylinder by way of a conduit 13. The piston of said cylinder accordingly raises said frame 3 and blades 4 and 5 to the up position. It will be noted that according to Figure 1, the light beam 9 strikes the photoelectric device 11 while the rear end of the quire is still vertically above the blade 5 but by the time the blade has moved upwards between the wires of the conveyor the quire has advanced sufficiently to clear said blade.

For effecting the horizontal movement of the rear blade 5 a second air cylinder 14 is provided, mounted horizontally in rigid relation on said frame, and the piston rod 15 of the piston of said second cylinder is attached to said rear blade 5. When the piston rod 7 of the first air cylinder moves into its upper limit a projection 16 thereon mechanically closes a normally open contact C2 which thereby energises a second solenoid S2 (see Figure 5) which operates a valve not shown to allow compressed air to enter said second air cylinder 14 by way of a conduit 15 at its rear end and to exhaust from a conduit 16 at its forward end. The piston of said air cylinder thereby moves said rear blade 5 forwards.

When said rear blade 5 reaches the forward limit of its movement a projection 17 on its piston rod 15 engages and opens the aforesaid contact C1 which is connected in the circuit of the relay winding RW. The relay accordingly drops out and de-energises the first solenoid S1 which thereby operates the valve of the first air cylinder 8 to permit the compressed air to flow in through the conduit 13 and exhaust through the conduit 12, so that the frame 3 and its blades 4 and 5 are again lowered. This causes the aforesaid contact C2 to be opened which de-energises the solenoid S2, thereby operating the valve of the second air cylinder to permit compressed air to flow in through the conduit 16 and exhaust through the conduit 15, so that the rear blade 5 is returned rearwardly to its normal position. This will of course reclose the contact C1, but by now, as shown in Figure 3, the next quire will have cut off the light beam 9 from the photoelectric device 11, so the relay winding RW will not be re-energised until said next quire reaches said given position, whereupon the gap behind it will enable the photoelectric device 11 to be again activated and the whole cycle will be repeated for stacking said next quire.

Obviously other means than compressed air, such for example as electric motors, could be employed for actuating the frame and the rear blade.

Further, instead of using a photoelectric device to initiate each cycle of operation, any other device, such for example as a sensitive limit switch responsive to the absence of paper, may be used.

In the arrangement above described the forming of the papers into a vertical stack is effected by keeping the front blade stationary and moving the rear blade horizontally forwards. In some cases it may be found better to move the front blade horizontally rearwards at the same time as the rear blade is moved horizontally forwards.

I claim:

1. In a system for conveying and stacking overlapped articles, means for conveying said articles in spaced apart groups in a substantially horizontal plane, a plurality of barrier elements, means for moving said barrier elements so that when one of said groups on said conveyor means reaches a given position one of said barrier elements intersects the path of travel forward of said groups and the other of said barrier elements intersects the path of travel behind said group, and means for relatively moving one of said barrier elements toward the other to cause said overlapped articles to form a stack.

2. In a system for conveying and stacking overlapped articles, means for conveying said articles in spaced apart groups in a substantially horizontal plane, a plurality of barrier elements, and control means including means responsive to passage of each group of articles past a given point to move said barrier elements to intersect the path of travel of each group of articles rearwardly and forwardly thereof, and means responsive to attainment of intersecting position by said elements to move one of the latter toward the other to cause the overlapped articles of each group to form a vertical stack.

3. The combination according to claim 2 wherein said control means also includes means responsive to movement of one of the barrier elements toward the other a predetermined distance to effect movement of both of said barrier elements out of intersection with the path of the articles.

4. The combination according to claim 3 wherein the last mentioned means also moves said one of said barrier elements away from the other said predetermined distance following movement of the same out of intersection with the path of travel of said articles.

5. The combination according to claim 2 wherein said barrier elements are supported on a common base to be moved together into and out of intersection with the path of travel of said articles.

6. The combination according to claim 5 wherein the barrier element which intersects the path of travel of said

articles rearwardly thereof moves said predetermined distance toward and away from the other barrier element.

7. The combination according to claim 2 wherein said means responsive to passage of each group of articles past said given point comprises photo-electric means, a relay energized by response of said photo-electric means and means operable upon energization of said relay to move said base to afford intersecting relation of said barrier elements with the path of articles, wherein said means responsive to attainment of intersecting position of said barrier elements comprise a switch and means operable by said switch to move said one of said barrier elements toward the other, and wherein said means responsive to movement of said element said predetermined distance comprises a second switch in circuit with said relay which responds to deenergize said relay.

8. The combination according to claim 7 wherein said means operable upon energization of said relay and said means operable by the first mentioned switch are fluid powered.

9. In combination, means for conveying overlapped articles in spaced apart groups, a plurality of barrier elements, a base on which said barrier elements are mounted and on which one element is movable toward and away from another fixed on said base, an electro-responsive relay, photo-electric means responsive to passage of each group of articles past a given point to energize said relay, means comprising fluid power means under the control of electroresponsive means responsive to energization of said relay to move said base to cause said barrier elements to intersect the path of travel of a group of articles rearwardly and forwardly thereof, switch means operable by attainment of intersecting position of said barrier elements, means comprising fluid power means under the control of electroresponsive means responsive to operation of said switch means to move said one barrier element a predetermined distance toward the other to vertically stack the articles in each group, and switch means operable by movement of said one element said predetermined distance to deenergize said relay.

10. The combination according to claim 9 wherein deenergization of said relay results in deenergization of both of said electroresponsive means to cause return of said base and said one barrier element on said base to initial positions out of intersecting relation to the path of travel of the articles.

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