METHOD AND MACHINE FOR STACKING BATCHES OF NEWSPAPERS

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FIG. 12

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ABSTRACT OF THE DISCLOSURE

According to the invention there is provided a compact machine for stacking batches of daily newspapers, weeklies, and like flat articles. The batches are located at spaced intervals on a first conveyor and are fed one by one to a vertically movable lifting table. The batches are then lifted one by one by raising the lifting table from its lower end position to a predetermined upper end position where two gripping arms engage the batch and retain it when the lifting table is returned. The two gripping arms are rotatable about a vertical axis in order to turn the pile held by the gripping arms into different angular positions before the next batch is supplied to the bottom of the pile. The complete pile is finally pushed out onto an outlet conveyor at level with the lower ends of the gripping arms.

This invention relates to machines for stacking batches of daily newspapers, weeklies, and like flat articles. In order to facilitate removal of a predetermined number of newspapers from a stack, the piles which contain a predetermined number of newspapers have their backs alternately turned in opposite directions. This is also to advantage in case of folded newspapers where the thickness of the folded back is different from the thickness of the opposite edge. Due to the alternating directions of the batches the stack becomes more stable.

In a known stacking machine the batches of newspapers are conveyed to a turning device which turns every second batch half a revolution and then drops the batch on a stacking table. In another known stacking machine the batches are placed on a stacking table which is turned half a revolution after the deposition of each batch. If the batches are of relatively small heights it may be sufficient to turn the table before it receives the third or fourth batch so that two or three batches are pointing in the same direction before they are turned.

The known machines suffer from the inconvenience that the batches are freely falling on the stack. It is true that the batches during the fall are laterally guided by vertical guide plates, but in spite thereof the newspapers are likely to be displaced relative each other at the moment of their impact. This is due to the fact that air enters between the newspapers of the batch during the downward movement with the result that the newspapers will more easily slide in the lateral direction relative each other which in turn results in irregular sides of the batches in the stack. This makes the continued manipulation of the stack more difficult.

The general object of the invention is to avoid the above named inconveniences and to provide a compact stacking machine which renders possible stacking of batches of newspapers and the like with the batches alternately turned in desired directions and which is constructed such as to avoid separation of the newspapers and entering of air between the newspapers in the respective batch while this batch is added to the stack.

Another object of the invention is to provide a stacking machine adapted to receive batches of newspapers at a lower level and to deliver the finished stack at a higher level corresponding to a convenient working height.

These and other objects of the invention and the manner in which they are attained will appear from the following description of a stacking machine constructed in accordance with the invention.

FIG. 1 is a longitudinal sectional view taken along the line 2—2 in FIG. 3 and illustrates an inlet conveyor for placing batches of newspapers on a vertically movable stacking table disposed right below a gripping device adapted to grip a lifted batch for forming a stack from below wherein the stack can be pushed out onto an outlet conveyor located at a higher level than the inlet conveyor.

FIG. 2 is an enlarged longitudinal sectional view of a receiving table located at the end of the inlet conveyor. FIG. 3 is a top view of the receiving table shown in FIG. 2.

FIG. 4 is a sectional view along the line 4—4 in FIG. 3 of one of the rollers of the receiving table.

FIG. 5 is a sectional view along the line 5—5 in FIG. 3 of one of the drive wheels for the rollers of the table.

FIG. 6 is a sectional view taken along the line 6—6 in FIG. 3 and illustrates a driving belt pulley and the connection thereof with one of the rollers of the table.

FIG. 7 is a top view of a vertically movable table comprising a central portion and supporting bars projecting therefrom.

FIG. 8 is an enlarged lateral elevation of the turntable gripping device for the stack.

FIG. 9 is a front view of the gripping device shown in FIG. 8 and illustrates the two laterally swingable gripping arms thereof.

FIG. 10 is an enlarged sectional view taken along the line 10—10 in FIG. 8.

FIG. 11 is a detail view of the driving device for two centering plates disposed one on each side of the receiving table.

FIG. 12 is a section along the line 12—12 in FIG. 11.

FIG. 13 is a section taken along the line 13—13 in FIG. 11.

FIG. 14 is a section along the line 14—14 in FIG. 11.

FIG. 15 is a section along the line 15—15 in FIG. 11.

The machine comprises a frame 10 which supports an inlet conveyor 11 on one side of the machine and an outlet conveyor 12 on the other side of the machine, as will be seen from FIG. 1, the outlet conveyor 12 is located at a higher level than the inlet conveyor. The height of the outlet conveyor above the base 13 of the machine is preferably adapted such that an operator in standing position easily can handle the stack of newspapers on the conveyor 12.

The inlet conveyor 11 places the batches 14 one by one on a receiving table 15 (FIGS. 2, 3) consisting of a plurality of rotary rollers 16. When a batch strikes against an abutment 17 a switch is actuated which starts lifting a vertically movable stacking table 18 which consists of a central portion 19 and lateral bars 20 (FIG. 7) and which is located on a level with or slightly below the receiving table 15. As a result the batch will be lifted to a position on a level with the outlet conveyor 12. At the same time the gripping arms 22, 23 (FIG. 9) of the gripping device 21 are swung away from the fetch so as to permit lifting of the batch. Thereafter the gripping arms are swung inwardly so that their fingers 24 can hold the lifted batch from below. Consequently, this batch will be retained while the table 18 is lowered to its initial position.

The upper end of the gripping device 21 is rotatably mounted in casing 25, and the turning movement is controlled in a manner such that the gripping device when
desired makes half a revolution for turning the batches in the gripping device with respect to the next batch to be lifted.

When the next batch is lifted by the table 18 the gripping device will be opened just before the batch approaches the lower end of the gripping device, resulting in that the batch or batches contained in the gripping device will be placed on that batch which is being lifted. The table 18 is lifted still more until the underside of the lowestmost batch can be gripped and retained by the gripping device.

After the stack is finished in the holder formed by the gripping device 21, a pusher 26 is actuated which forces the finished stack 27 from the gripping device to the outlay conveyor 12.

The two conveyors 11, 12 are driven by a common electric motor 27 which also drives the rotary rollers of the receiving table 15.

Referring to FIGS. 2 to 6, the feed table consists of two rows 28, 29 of rotatably mounted oblong rollers 16. As will be seen from FIG. 3, the inner ends of the two rows are spaced apart so as to provide for a free intermediate space. The rollers consist of cylinders 30 (FIG. 4) which are rotatably mounted on pins 31 secured in side plates 32. Gear wheels 33 are secured to the inner ends of the cylinders 30. Provided between each pair of adjacent rollers are rotatable intermediate gear wheels 34 which are mounted on studs 35 secured in the side plate 32 (FIG. 5). The cylinders 30 of the rollers 16 are driven from the rear end of the table where a drive shaft 350 for the guide pulleys 36 and rollers 37 of the inlet conveyor is mounted in the opposite side plate 32 and carries a belt pulley 38 which via a belt 39 (FIG. 2), a pulley 40 and a belt 41 is connected to the electric motor 27. Mounted on the shaft 350 for each row of gear wheels 33, 34 is a driving gear wheel 42 for rotating the rollers of the feed table by means of the intermediate wheels 34.

Pivotedly mounted at the end of the receiving table 15 is an abutment arm 17 which forms a stop to the arriving batch and actuates a limit switch 43 comprised in the control circuit for actuating a vertical lifting cylinder 44 (FIG. 1) the piston rod 45 of which carries the lifting table 18.

Referring to FIG. 7, the vertically movable table 18 consists of the longitudinally extending central portion 19 and the lateral bars 20 secured to the central portion on either side thereof. From FIGS. 1 and 3 it will be understood that the central portion 19 can be lowered into the free intermediate space between the ends of the rollers 16 of the receiving table 15 and that the lateral bars 20 at the same time will move downwardly into the intervals between the rollers 16. Provided at the inlet end of the table 18 is a depending step plate 46 which obstructs the entrance to the receiving table when the table 18 is in its top end position.

The table 18 is provided at its ends with two guide bars 47, 48 which are replaceable in stationary guide members 49, 50. The lower end of the bar 48 has a collar 51 which defines the top end position of the table 18 and cooperates with two limit switches 52, 53 for controlling the movements of the gripping device 21 synchronously with the movements and positions of the table 18.

Before the table 18 is lifted the batch on the receiving table is centered by means of two vertical centering plates 54, 55 provided on either side of the table. These plates are illustrated separately in FIGS. 11, 12, 13.

The centering plates 54, 55 are carried by two interconnected parallelogram systems so that the plates will retain their vertical positions during movement toward and away from the batch. The centering plates 54 and 55 are carried by two pairs of crank arms 56a, 57a and 56, 57, respectively. For the sake of simplicity the mounting of one pair of arms only will be described, namely, the pair shown to the right in FIG. 12. The plate 55 is provided on its outside with two brackets 58, 59 which at 60, 61 are pivoted to the arms 56, 57. The upper pair of crank arms 56 (FIG. 11) is secured on a shaft 62 mounted in the frame 10 and the lower pair of crank arms 57 is secured on a shaft 63 mounted in the frame 10. As will be seen from FIG. 13, the two shafts 62, 63 and 62a, 63a are provided each with a crank arm 64, 65, said crank arms being interconnected by means of links 66 and 66a, respectively. Consequently, the plates 55 and 54 will retain their vertical positions when the gripping arms 55, 57 are swung upwardly and backwardly.

In order to have the two plates 54 and 55 move simultaneously, their parallelogram systems are interconnected in the manner shown in FIG. 15. The lower shafts 63, 63a have each a crank arm 67, 68 one of which is upwardly directed and the other one is downwardly directed. A link 69 connects the crank arms 67, 68 with each other. Consequently, rotation of the shaft 63 in a direction for inward turning of the crank arms 56, 57 and inward movement of the centering plate 55 toward the batch will result in a corresponding turning movement of the shaft 63a on the other side and in a corresponding pressure on the plate 54.

As shown in FIG. 14, the shaft 63 is rotated by means of a pneumatic cylinder 70 the piston rod 70a of which actuates a crank arm 71 secured on the shaft 63.

The forward end of the batch on the receiving table 15 abuts against two vertical fixed stop arms 72, 73 disposed one on each side of the pivotable arm 47 and the sides of the batch are actuated by the two centering plates 54, 55. As a result the batch has vertical and comparatively even sides. Thereafter the cylinder 44 is actuated by means of the switch 43 for lifting the table 18 together with the batch to the rotary gripping device 21.

The gripping device 21 or holder will be best seen from FIGS. 8 to 10. The two swingable gripping arms 22, 23 are symmetrically arranged. For the sake of simplicity one gripping arm 23 only will be described. As will be seen from FIG. 8 it consists of two vertical lateral arms 74, 75 which are connected with each other by means of a cross bar 76 and attached at their upper ends to a shaft 77 mounted in two bearings 78, 79 which are connected to a plate 80 which is secured to the head 81 of the gripping device, said head being rotatably mounted in the casing 25. The casing 25 contains a change gear, not shown. The corresponding shaft for the gripping arm 22 is denoted at 77a. Each of the shafts 77, 77a is provided with a pair of crank arms 82, 82a the inner ends of which are co-axial as viewed in FIG. 9 and each of which has a downwardly directed link 83, 83a the ends of which are interconnected by a pivot pin 84 which is connected to the lower end of a piston rod 85 of an actuating cylinder 86. Upon downward movement of the piston rod 85 the arms 82, 82a will be swung downwardly resulting in that the gripping arms 22, 24 will be swung outwardly from the position shown in FIG. 9.

Between the lower ends of the arms 74, 75 and 74a, 75a there is rotatably mounted a shaft 87 and a shaft 87a, respectively. Mounted on the shaft 87 is a row of spaced pins 88 which carry rotatably mounted sleeves 890 which form the fingers 24. The shafts 87 and 87a are turnable from the position shown in FIG. 9 in which stop arms 88 limit the downward movement of the rollers 24 to the horizontal gripping position shown. From this position the fingers 24, 24a can be turned upwardly if the batch from below comes in contact with the fingers, i.e., in the event that the gripping arms 22, 23 have not been swung apart for receiving the batch.

Between the two lateral arms 74, 75 and 74a, 75a of the gripping arms 22 and 23 respectively, there is provided a frame secured to the plate 80 and consisting of two vertical supporting arms 89, 90 and cross bars 91, 92. These supporting arms 89, 90 retain their vertical positions when the gripping arms 22, 23 are swung outward-
ly in which case the supporting arms 89, 90 provided on either side of the batch or batches between the gripping arms 22, 23 will laterally guide the batches.

On the outside of the arms 89, 90 there are provided two vertical guide bars 89a, 90a for displaceable hold down bars 93, 93a which may be spring-biased and which are intended to abut the topmost batch of newspapers of the stack and to retain this batch in place during rapid turning movement and to guide the stack when it is pushed out by the pusher 26.

The pusher 26 consists of a vertical plate 94 which is secured to a pair of arms 95. The ends 96, 97 of the arms are joints for two links 98, 99 which have joints 100, 101 at their top ends. The joints 96, 97, 100, 101 are located at the corners of a parallelogram resulting in that the plate 94 always will be in a vertical position. An actuating cylinder 102 is connected to the arm 98 for swinging the parallelogram system.

The cylinder 44 of the stacking table, the cylinder 70 for the centering plates, the cylinder 102 for the pusher, and the actuating cylinder 103 of the gripping device for turning the cylinder 86 for the gripping arm are contained in a control system which comprises microswitches adapted to be actuated for the opening and closing of valves in air lines for the various actuating cylinders for obtaining the desired synchronized energization and deenergization of the cylinders. This control of the various cylinders is effected in a conventional manner and is therefore not described.

From the above description it will be evident that in a stacking machine according to the invention the batches are stacked without the necessity of falling freely. Instead thereof a very effectively controlled supply of the stack with batches from below is obtained due to the fact that a centered batch is lifted into contact with the lower side of the stack and forces the stack upwardly between the stationary guide means 89, 90 and 89a, 90a until the lifted stack can be gripped by the fingers 24, 24a when the gripping arms 22, 23 have been swung back into the position according to FIG. 8. As the lower side of the stack will then be practically on a level with the fingers 24, 24a which means that the stack will be deposed as soon as the table 18 starts its downward movement from its top position.

What I claim is:

1. A method of stacking batches of flat objects, such as newspapers, weeklies and the like, wherein the batches are stacked such as to have predetermined angular position relative to each other in the finished stack, characterized by conveying the batches one by one into a position right below the position of the stack to be built up, building the stack by lifting the batches one by one to a predetermined level, placing the overhead batch or batches on the lifted batch so as to be lifted thereby a distance substantially equal to the height of the batch, and turning the thus partly finished stack through part of a revolution in the one or other direction about the vertical central axis of the stack before moving the next batch from below to the stack.

2. A stacking machine of the character described for stacking batches of newspapers and the like and having an inlet conveyor and an outlet conveyor with the two conveyors disposed vertically at different levels from each other, and a vertically movable lifting table movable between said conveyors, the combination comprises a lifting device connected to said table for moving said table from a position adjacent said inlet conveyor to a position adjacent said outlet conveyor and vice versa, a pair of spaced-apart opposed gripping arms swingably disposed above said table adjacent said outlet conveyor, a plurality of substantially horizontal carrier members disposed on the lower ends of said gripping arms and extending in opposed relationship to each other, with said gripping arms being swingable from a first position in which said carrier members are positioned for supporting a batch raised by said table, a rotatable support disposed at the upper ends of said gripping arms and connected thereto for forming a holder and for rotating said gripping arms and said horizontal carrier members through a predetermined part of a revolution about a vertical axis, and switching means interconnecting said conveyors, said lifting device, said gripping arms and said rotatable support for the sequential operation thereof for stacking said batches of newspapers.

3. A machine as claimed in claim 2, characterized in that the holder has secured thereto two opposed spaced-apart lateral supports the distance between which is equal to the width of a batch for guiding the batches located between the gripping arms when the gripping arms are swung outwards from each other for receiving a new batch at the lower end of the stack.

4. A stacking machine as recited in claim 3 which includes vertical guide means disposed on each of said lateral supports and hold down plates disposed on said guide means, which plates are freely displaceable along said guide means for abutting the upper side of a stack disposed therein.

5. A stacking machine as described in claim 4 which includes a vertical thrust plate disposed on one side of the said stack holder opposite said outlet conveyor, parallelogram-shaped supporting arms extending between the frame of said machine and the said thrust plate, and pneumatic cylinder and piston means connected to said supporting arms for the movement thereof and said thrust plate from a detached position to a position extending between said gripping arms for pushing a finished stack from said stack holder to said outlet conveyor.

6. A stacking machine as described in claim 2 in which said carrier members are a plurality of carrier pins disposed in a row on the lower end of each of said gripping arms, and which include a shaft rotatably disposed in each of said gripping arms with the said carrier pins connected thereto for providing the upward turning of the said pins from their normal horizontal position into a substantially vertical position.

7. A stacking machine as described in claim 2 in which the top of said lifting table is composed of a plurality of spaced-apart rollers, and which includes a stationary receiving table disposed adjacent said inlet conveyor for receiving the batches therefrom, the top of said stationary table also being composed of a plurality of spaced-apart rollers with the spaces therebetween accommodating the rollers of said lifting table in its lowest position.

References Cited

UNITED STATES PATENTS

1,880,077 9/1932 Dill et al. 214—6.5
2,904,941 9/1959 Midnight 214—6.2 X
2,970,708 2/1961 Watanabe et al. 214—6.2 X
3,092,266 6/1963 De Koning et al. 214—6.2
3,220,570 11/1965 Swanson et al. 214—6.2

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U.S. Cl. X.R.

214—6, 152