Title: A DEVICE FOR THE SEPARATION OF A SERIES OF PRODUCTS THAT ARE SUPERPOSED IN A SCALE-LIKE FASHION

Abstract: A device for achieving the separation or extension of the scale of products in a conveyance in superposed copies in which means are provided that are capable of increasing the speed of the belts (12, 17) conveying the separated or extended scale relative to the speed of the upstream belt (11) of the device for the conveyance of the scale before the separation or extension.
A DEVICE FOR THE SEPARATION OF A SERIES OF PRODUCTS THAT ARE SUPERPOSED IN A SCALE-LIKE FASHION

The object of the present invention is a device for the separation or extension of a series of products that are transported in a scale-like fashion, that is superposed to one another in a herring-bone fashion, in order to create groups of products that are spaced apart from one another in order to ease the stacking operations of the same on suitable machines provided for that purpose, or to divert the flow of the scale-like transported product for the intended processing operations.

The applied technique has consisted up to now in stopping the scale-like transported products by means of a barrier, such that the upper products are retained by the barrier and accumulate against the same. The lower products, in contact with the belt or belts, slide under the barrier, thereby creating the gap between succeeding groups of products.

Based on the previous explanation, it is evident that the separation between groups of products is the greater, the longer the time during which the barrier remains lowered on the scale-fashion conveyor is. Conversely, the longer the barrier remains lowered on the scale-fashion conveyor, the greater is the amount of products that are accumulated against the barrier, thereby making the stacking operations or subsequent processing operations more difficult, and in many cases even impossible, to be carried out because of the excessive accumulation of the product against the barrier. The greater the thickness of the scale-fashion transported product and its speed, the greater is said processing difficulty. In order to possibly carry out the product processing or stacking, the production rate is lowered.

The object of the present invention is to solve the above-described problem in a reliable way, such that the production speed and the thickness of the scale-fashion transported product have no influence. The scale-fashion transported products can be: signatures, paper or paperboard sheets, folded carton boxes, and
the like. By the term 'signature' as it is used in the present application we mean an assembly of folded sheets that are called four-page, eight-page, 16-page, 32-page folder, and so on, according to the number of sheet faces a signature comprises.

The features, advantages and the solution of the technical problem the present invention is based on will become evident upon reading the detailed description herein below of a preferred but non exclusive embodiment, said embodiment being illustrated in a non-limiting manner in the accompanying drawing, in which:

Figures 1a, 1b, 1c represent the side-view of the subject device, in three different positions;

Figure 2 schematically represents a plan view of the way the device is driven; and

Figure 3 represents a side-view of the driving means of Figure 2.

Referring now to Figures 1a, 1b, 1c, the device comprises the conveyor 1 on which material 2 is arranged in a scale-like fashion, said material being herein after referred to as products for convenience of description.

From the conveyor 1 the products are passed onto the movable carriage 3 that is driven in a reciprocating manner as shown by means of arrow 4. The reciprocating motion of carriage 3 is implemented by means of toothed belts or chains 5, on which a pawl 5' is integrally arranged, said pawl 5' sliding along the slot that is formed in the prismatic piece 6, which is integral with the carriage 3. The reciprocating motion of carriage 3 can be accomplished with equivalent means, such as: connecting rod and crank, air or hydraulic piston, rack device. Pawl 5' can be substituted by equivalent means.

The sprocket wheels 7 driving the chains 5 are integral with shaft 8 that is connected with a brake-clutch device 9, which in turn is connected with pulley 10 (Figure 2). Part of the path of belts 11 and 12 extends over the movable carriage 3 that runs on the rails 13, which are fixed on the machine structure. Rollers 14 that slide on the rails 13 are integral with carriage 3.

Carriage 3 is provided with rollers 15 that can be adjusted according to the format of product 2 with the point of contact of roller 16 and belts 12. On the
roller 16 the upper conveyor belts 17 are wound the path of which partly extends over the movable carriage 3.

Motor 18 carries a pulley 19 that drives, through a belt, pulley 20, said pulley 20 being integrally connected with shaft 21 on which the pulleys 22, 23, 24, 25 are arranged.

Pulley 22 is connected through a belt with pulley 26, said pulley 26 being integrally connected with shaft 27 on which the driving pulleys 28 for belts 11 are fixed.

Pulley 23 through a belt drives pulley 29 that is integrally connected with a friction clutch 30. When engaged, the friction clutch 30 is connected to shaft 31 on which the pulleys 32 are fixed, said pulleys 32 driving the belts 12. A pulley 33 is integrally connected with shaft 31 and through a belt drives pulley 34, said pulley 34 being integrally connected with shaft 35 on which the driving pulleys 36 for belts 17 are fixed.

Pulley 25 is connected through a belt with pulley 10.

Pulley 24 is connected through a belt with pulley 37 that is integrally connected with a ratchet 38, said ratchet 38 engaging shaft 31 that can increase its rotational speed when it is engaged by the motion of clutch 30.

Wheels 15 can be adjusted according to the length of product 2 such that distance of wheels 16 and wheels 15 is equal to or greater than the dimension of the product that is being processed. After the path of belts 12 and 17, the products can be stacked in a stacking station 39, or channelled to the subsequent processing.

Herein after the cycle for the separation of scale-like arranged signatures is described.

The products 2 coming from a scale-fashion conveyor 1, the flow direction of which is indicated by arrow 40, run on belts 11 and belts 12, said belts being driven by motor 18. When an agreement for clutch 30 to be engaged is output, said clutch driving belts 12 through the pulleys 32 and belts 17 through the pulleys 36, the speed of said belts is increased, this being due to the different ratio between pulleys 23 and 29, the friction clutch being at the same time actuated and
the brake of the brake-clutch group 9 being disengaged, which brake-clutch group drives the chains 5 that move the carriage 3. The speeds of carriage 3 and belts 11 are almost the same. Products 2 that are under the rollers 15 and the belts 11 are retained, whilst the carriage 3 is advanced, as the relative speed between the carriage and the belts 11 is almost the same.

The products 2 that are beyond the point of contact of rollers with the belts 11 start slipping from under the scale as a consequence of the increased speed of belts 12 and 17 that pinch the products 2, thereby accelerating them.

The speed increase of belts 12 and 17 is caused by the engagement of friction clutch 30 that is integrally connected with pulley 29, the rotation ratio of pair of pulleys 29-30 being greater than the rotation ratio of pair of pulleys 24-37 that transmits the motion to belts 12 and 17 before the friction clutch 30 is engaged. The ratchet, which is integrally connected with the drive of pulley 37, allows the rotational speed of shaft 31 to be increased, such speed increase always being in the running direction.

When carriage is in the fully advanced position (fig. 1c), the separation of the scale with no superposition of the products will have been achieved. When carriage 3 goes back again to its departure position (fig. 1a), owing to the movement of the chain cooperating with the prismatic piece 3 that is integral with carriage 3, the brake of the brake-friction clutch group 9 is actuated, while the clutch of the brake-friction clutch group 9 is disengaged. Whereas, friction-clutch 30 is preferably disengaged when carriage 3 is in the fully advanced position (fig. 1c), however in any such place of the path of carriage 3, that the separation or extension of the scale is achieved in a position in which there not an excessive superposition of the scale downwards from the opening or separation point of the scale.

When carriage 3 is in the starting position, a new scale separation operation can be carried out.

The length of belts 11 during the motion of carriage 3 remains unchanged because the section 41, which is in contact with the products that are arranged in a scale-like fashion and extend between roll 43, said roll 43 being fixedly attached
to the movable carriage 3, and roll 45, said roll 45 being fixedly attached to the non represented structure, becomes longer. On the contrary, the section 42 of the belts 11, reaching from roll 28, said roll 28 being fixedly attached to the structure, and roll 44, said roll 44 being fixedly attached to the movable carriage 3, becomes shorter in the same amount as section 41 becomes longer.

The length of belts 12 also remains unchanged because during the movement of carriage 3 the section 47 of the belts that is in contact with the scale in lower section and is comprised between roll 48, said roll 48 being fixedly attached to the structure, and roll 46, said roll 46 being fixedly attached to the movable carriage 3, becomes shorter. On the contrary, the section 48' of the belts 12, reaching from roll 32, said roll 32 being fixedly attached to the structure, to roll 49, said roll 49 being fixedly attached to the movable carriage 3, becomes longer in the same amount as section 47 becomes shorter.

The length of belts the 17 that are in contact with the upper part of the scale remains unchanged in the course of the displacement of carriage 3 because section 53, reaching from roll 50, said roll 50 being fixedly attached to the structure, to roll 16, said roll 16 being fixedly attached to the movable carriage 3, becomes shorter during the displacement. On the contrary, the section 51 of the belts 17, reaching from roll 52, said roll 52 being fixedly attached to the movable carriage 3, and roll 54, said roll 54 being fixedly attached to the structure of the machine, becomes longer in the same amount as section 53 becomes shorter.

The opposite of what has been described concerning belts 11, 12, 17 occurs when the carriage from its fully advanced position returns to the cycle-start position.

The friction-clutch 30, the brake-clutch 9, the ratchet 38 can be substituted with equivalent mechanical members, such as: electronic-control motors, hydraulic or pneumatic motors, air pistons or oil pistons, provided they are suitable to achieve the same effects as the present invention.

While the scale separation or extension cycle is carried out, the speed of motor 18 driving the belts 11, 12, 17 and the movable carriage 3 is preferably reduced relative to the speed of motor 54 driving the conveyor 1 in order not to
have an excessive speed of carriage 3 and a high increase of the speed of belts 12 and 17 operating the separation or extension of the scale. This involves a reduction of the pitch of scale in that moment, when the products arranged in a scale-like fashion are transferred from conveyor 1 to belts 11. Such a reduction of the pitch of the scale has no effect on the subsequent processing steps.

The scale separation cycle can also be carried out by reducing the speed of belts 11 relative to belts 12 and 17.
CLAIMS

1. A device for obtaining a separation or extension of the scale of products (2), consisting of signatures, paper or paperboard sheets, folded boxes and the like, in a conveyance in copies that are superposed in a scale-like fashion, characterized in that it comprises: a movable carriage (3), said carriage preferably moving with the same speed as the scale-fashion conveyor (1); means (15), that can be adjusted according to the dimension of the products that are to be retained, for the retention of the scale; means for changing the speed of the belts (11, 12, and 17) of the conveyor; means for uncoupling the speed of belts (12, 17) of the conveyor without interfering with the speeds of the upstream and downstream belts of the scale-fashion conveyor.

2. A device as claimed in claim 1, characterized in that the speed of the carriage (3) that is coupled to a shaft (8), said shaft being driven by a motor (18), is essentially the same as the speed of a belt (11) that causes the products (2) arranged in a scale-fashion to be advanced.

3. A device as claimed in any of the preceding claims, characterized in that the speed of belts (12, 17) increases upon intervention of a friction clutch (30) that is on a shaft (31), said shaft being coupled with the pulleys (32) of belt (12) and with the pulleys (36) on a shaft (35) of belt (17).

4. A device as claimed in any of the preceding claims, characterized in that during the displacement of carriage (3) from the starting position to the final one, in which the products (2) arranged in a scale fashion are separated, the length of belts (11, 12, 17) remains unchanged.

5. A device as claimed in any of the preceding claims, characterized in that the carriage (3) is coupled to a brake-clutch or motor device that causes its motion.

6. A device as claimed in any of the preceding claims, characterized in that a ratcheting device allows the rotational speed of the transmission assembly driving the belts (12 and 17) to be uncoupled when the speed increase of the same occurs.

7. A device as claimed in any of the preceding claims, characterized in that during the stroke of carriage (3) there occurs a variation of the speed of belts (11).

8. A device as claimed in any of the preceding claims, characterized in that at the time of the separation of the scale the speed of belts (11) is reduced relative to the speed
of belts (12 and 17).
Fig. 3
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

| IPC | B65H33/12 |

According to International Patent Classification (IPC) or to both national classification and IPC.

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

| IPC | B65H |

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched.

Electronic data base consulted during the International search (name of data base and, where practical, search terms used).

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

**Date of the actual completion of the International search**

20 September 2001

**Date of mailing of the international search report**

27/09/2001

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