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93

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[54] **APPARATUS FOR SEPARATING AND**
EVACUATING SHEET PRODUCTS
7 Claims, 4 Drawing Figs.
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93/36 SQ, 93/93 C, 93/93 DP
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B65b 57/20, B65b 65/02

ABSTRACT: An apparatus for separating and evacuating sheet products to produce packs by stacking from below, the sheet products being squared by reciprocating pallets and evacuated on to a conveyor belt, the apparatus including separating strips for introduction into the pack during assembly and a pusher to remove the assembled pack.

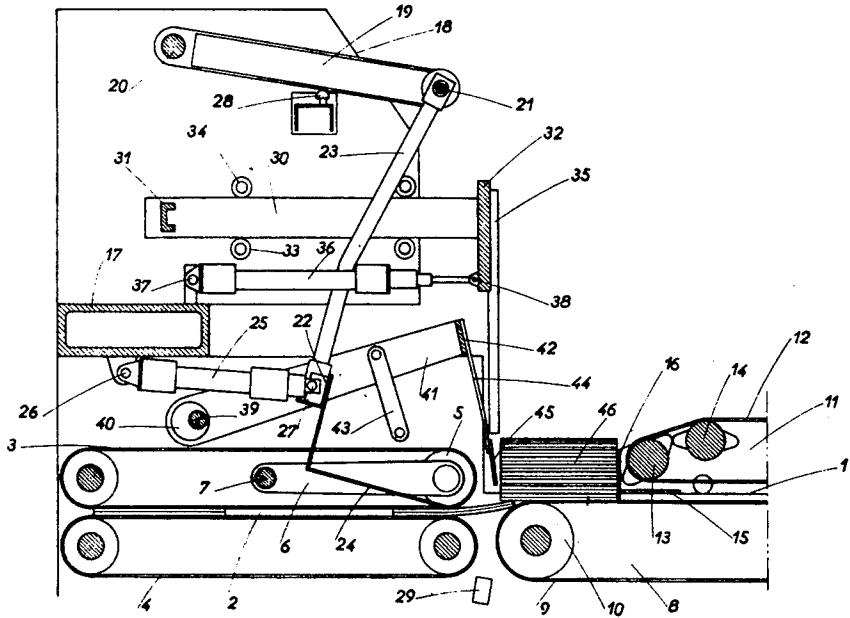


Fig: 1

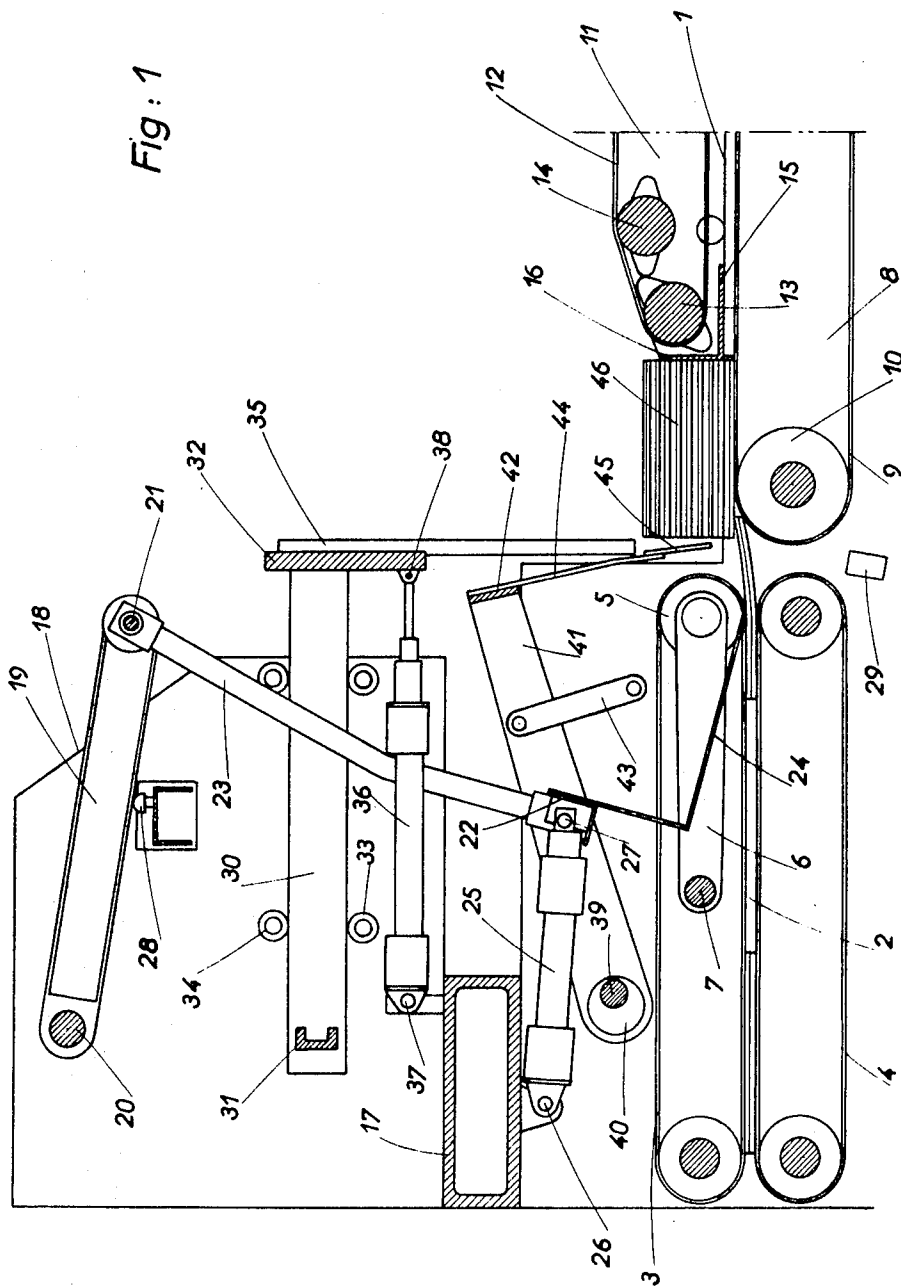


Fig: 2

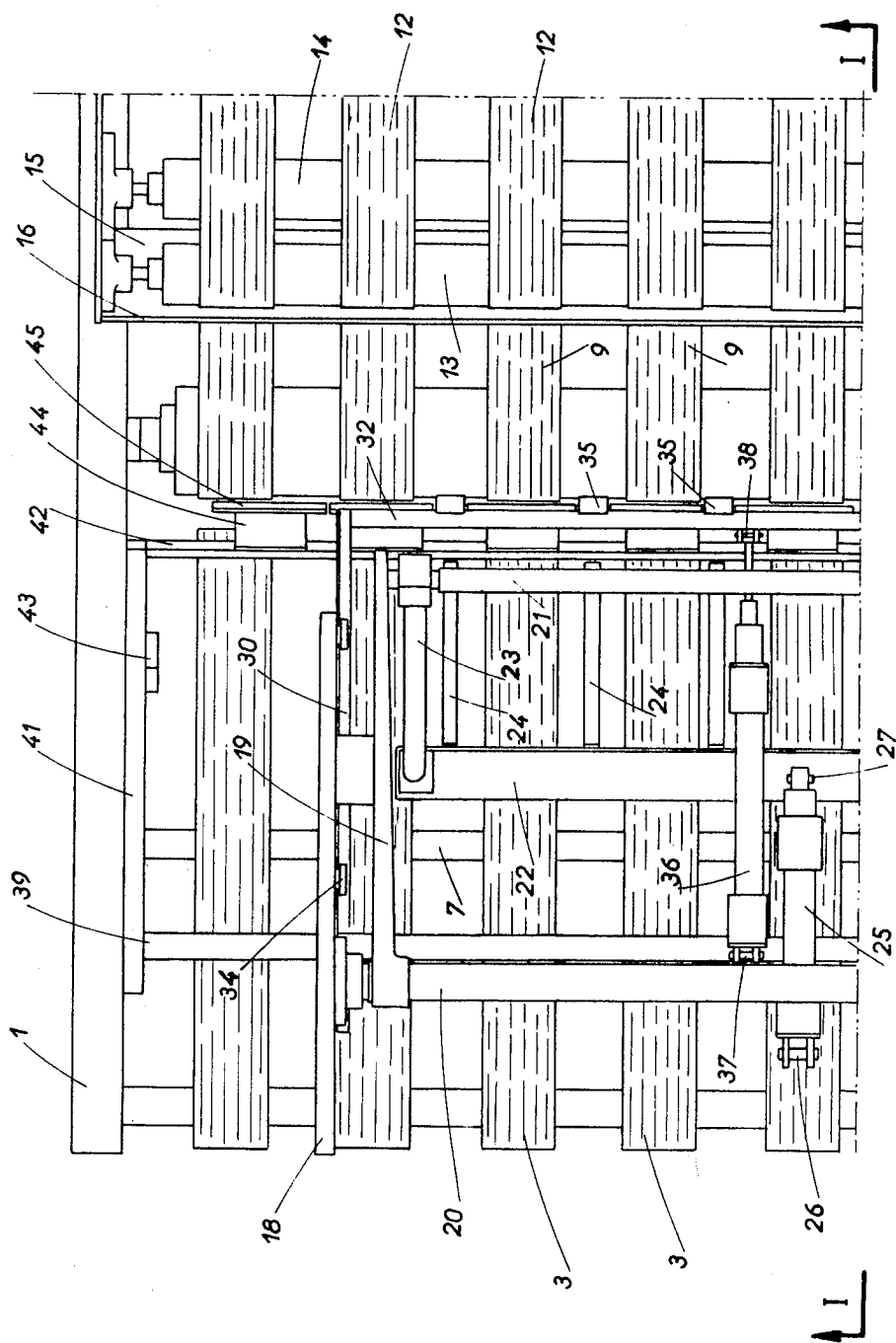


Fig : 3

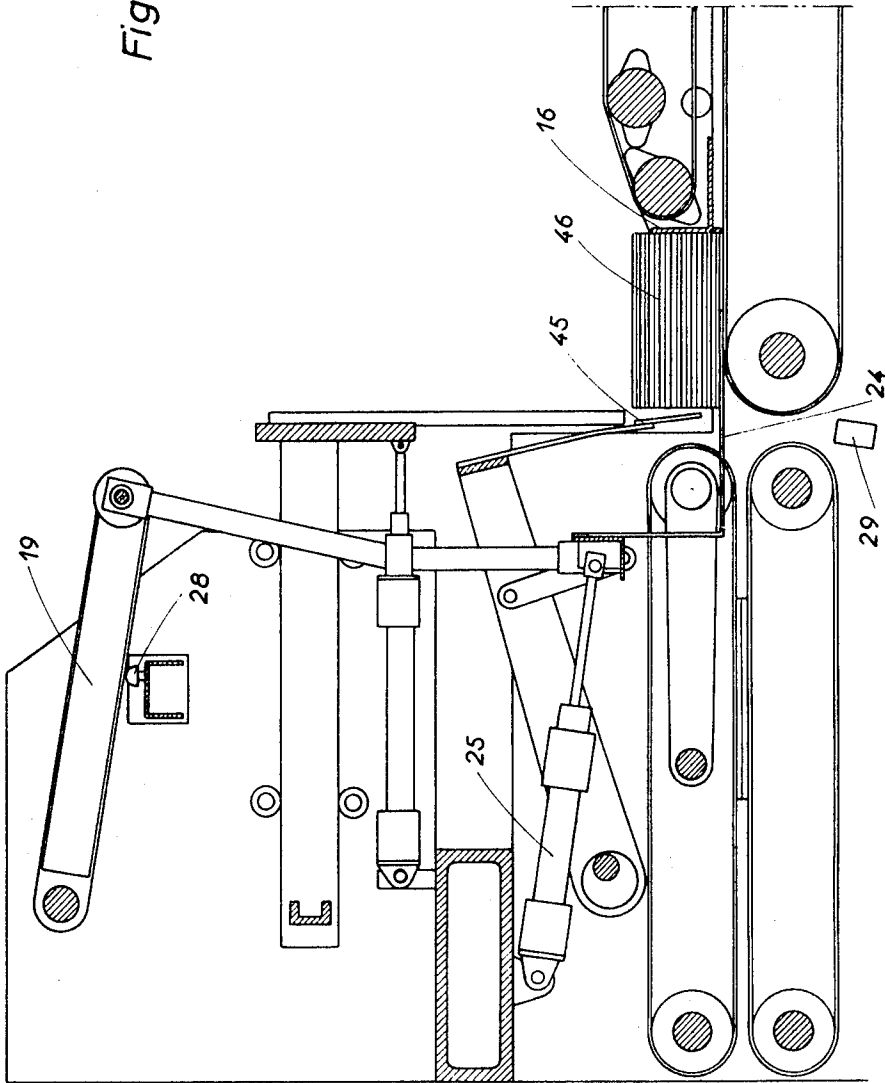
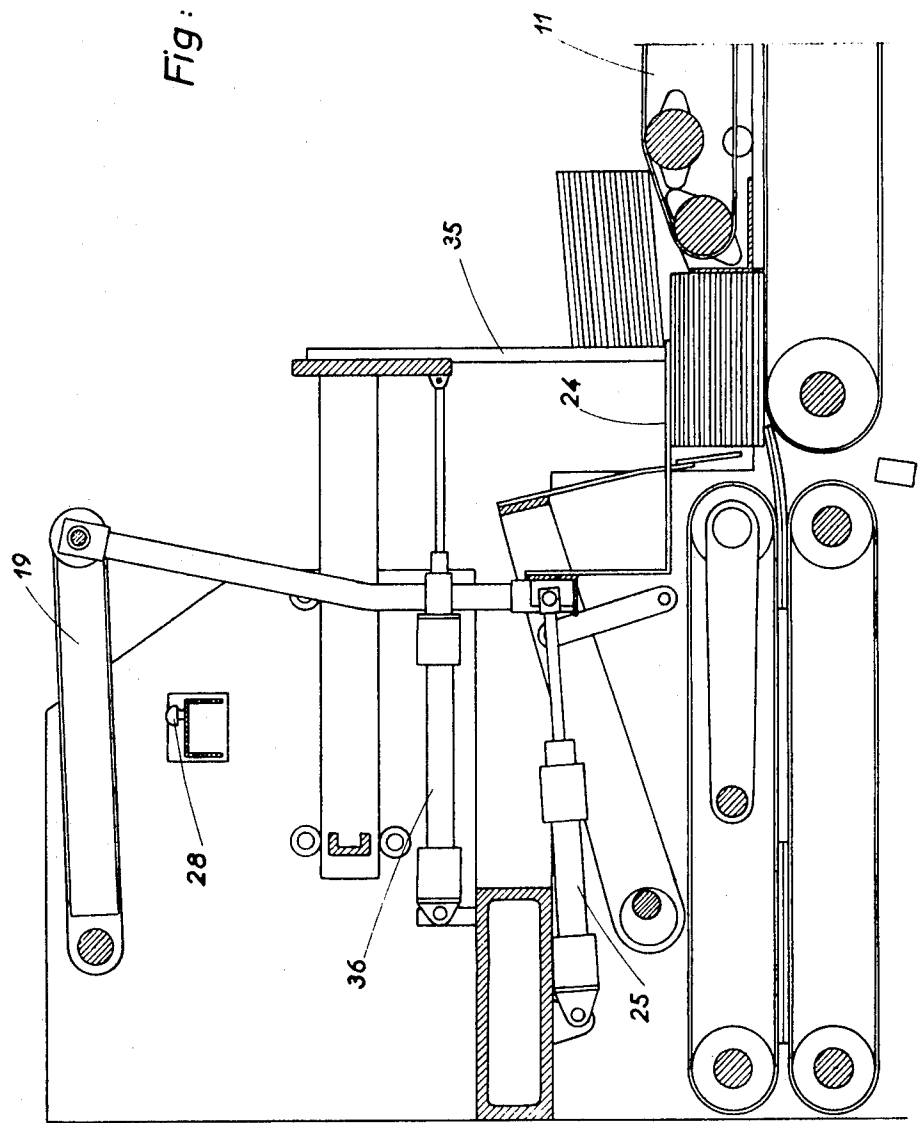


Fig: 4



APPARATUS FOR SEPARATING AND EVACUATING SHEET PRODUCTS

The invention relates to an apparatus for separating and evacuating sheet products, used, for instance, at the outlet station of a corrugated cardboard box-making machine, to deliver the boxes in regular packs or containing the same number of boxes, thus enabling the quantities of boxes supplied to be accurately controlled.

With the apparatus according to the invention the sheets are stacked from below, each fresh sheet being introduced beneath the preceding one in the lower portion of the pack in course of formation. This arrangement has the advantage of keeping the box under slight compression as soon as it is introduced into the pack, thus facilitating the final glueing of the box.

In prior art bottom-stacking apparatuses, ejection was periodically performed by a pusher which simply pushed the upper portion of the pack in the direction of an evacuating conveyor. However, the boxes have not necessarily the same thickness, and moreover they are usually irregularly stacked. It is not therefore certain that each movement of the pusher will entrain exactly the right number of boxes, and the resulting packs are not strictly identical. Moreover, the friction between the last box in the evacuated pack and the first box of the fresh pack means that each pack evacuation further disturbs the alignment of the stack. The packs finally obtained are irregular in shape, and a further squaring operation is needed to enable them to be correctly glued.

The invention obviates these disadvantages. According to the invention, in an apparatus for stacking packs from below, the sheet products being squared by reciprocating pallets and evacuated on to a conveyor belt, the apparatus comprises a set of horizontal separating strips connected to an assembly of articulated levers and adapted to be introduced to the lower portion of a pack in course of formation, the articulated levers allowing the separating strips free vertical clearance; a member for controlling the movement of the separating strips; an evacuating pusher comprising vertical bars each disposed opposite a separating strip; a member for controlling the movement of the pusher; and a sheet-counting device connected to the control of the movement of the separating strips and to the movement of the pusher.

An exemplary embodiment of the invention will now be described in greater detail with reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal section, taken along the line I-I in FIG. 2, through a machine using the apparatus according to the invention, the machine being only partly sectioned and only that portion comprising the apparatus according to the invention being shown;

FIG. 2 is a plan view of the same portion of the machine, but to simplify the drawing the transverse members 15, 13 and the stacked sheets 46 are not shown; and

FIGS. 3 and 4 are views corresponding to FIG. 1, showing different phases in the operating cycle of the apparatus.

Referring now to FIGS. 1 and 2, the machine having the sheet separating and evacuating apparatus comprises two longitudinal members 1 forming lower frames and supporting a number of endless conveyor belts. The first conveyor 2, which supplies sheets, receives the latter from the upstream sheet-making machine, and retains them pinched between an upper set of belts 3 and a lower set of belts 4 driven at the same speed. To clear a free space between the belts in the front portion of the upper conveyor, pulleys 5 are mounted at the end of arms 6 supported by a shaft 7.

The second conveyor 8, which receives the sheets, is formed by a set of belts 9 aligned with the belts of the first conveyor and driven by a drum 10.

The third conveyor 11, the evacuating conveyor, is formed by a set of belts 12, which are aligned with the belts of the two other conveyors, and extend over two shafts 13, 14 so as to

form an inclined plane facilitating the movement of the packs on to the conveyor.

The evacuating conveyor is mounted on a mobile frame 15 moving on longitudinal members 1 and regulatable in its longitudinal position in relation to the size of the packs to be stacked up, which abut rear portion 16 of the movable frame 15.

A transverse member 17 borne by longitudinal members 9 supports two inner frames 18. Two arms 19 are articulated to the frames 18 and connected by a shaft 20 which makes sure that the arms 19 move in parallel. The free ends of the arms 19 are connected via shaft 21. A transverse member 22 is rigidly connected to suspension arms 23 articulated to the shaft 21. Attached to the transverse member 22 are a series of shaped plates 24 forming separating fingers, each of the fingers being disposed opposite a gap between the conveyor belts. A pneumatic jack member 25 is articulated at a place 26 to the fixed transverse member 17 connected to the machine frame, and the end of its rod is articulated at the place 27 to the transverse member 22. The arms 19, the transverse member 22, the arms 23, and the jack 25 cooperate to form an articulated assembly which rests under its own weight by way of the arms 19 on resilient stops 28.

An ultrasonic cell 29 is disposed between the conveyors 2 and 8, and the signals which it records at the passage of each sheet are sent to a counter (not shown).

Disposed between the frames 18 is a rigid frame formed by two plates 30 interconnected by transverse members 31, 32. The plates 30 rest on lower rollers 33 attached to the frames 18, thus enabling the rigid frame to move horizontally. Upper rollers 34 complete the guiding of the movement of the rigid frame. Attached to the transverse member 32 are vertically adjustable vertical bars 35 forming pusher fingers and disposed vertically in relation to each separating finger 24. A pneumatic jack 36 whose framework is articulated at the place 37 to the fixed transverse member 17, has the end of its rod articulated at a place 38 to the transverse member 32 of the rigid frame forming the pusher.

Between the frames 1, a shaft 39 bears at each end an eccentric 40 rotating in a recess at one end of levers 41, connected at their other ends by a transverse member 42. Links 43 are articulated to the levers 41 and the frames 1. Mounted on the transverse member 42 are bars 44 bearing at their ends pallets 45 forming squaring pallets. The pallets 45 are disposed between the fingers of the pushers 35.

FIGS. 1 and 2 show the apparatus in its neutral position, i.e. during the mere formation of a stack of sheets on the belts of the stacking conveyor 8, for instance at the start of operation of the machine. The jack 36 is retracted, the pusher 35 is in the rear position, the arms 19 are resting on the stops 28, the jack 25 is retracted, and the separating fingers 24 are in the rear position between the belts, maintaining a free passage for the sheets pinched between the two sets of conveyor belts 2.

The sheets supplied by the conveyor 1 accumulate at a place 46 on the stacking conveyor, abutting the plate 16, and aligned by the reciprocation of the squaring pallets 45 driven by the eccentric 40. When the number of sheets stacked at the place 46 and detected by the cell 29 reaches the preselected number corresponding to the desired number of sheets per pack, the counter actuates, via, for instance, a conventional electric valve, the jack 29 which extends and brings the separating strips 24 above the stacking conveyor, and below the last sheet introduced into the pack. FIG. 3 shows the machine immediately after the movement for introducing the separating strips below the pack in course of formation.

The following sheets continue to be placed below the pack formed, but below the separating strips, which thus produce the separation between the two portions of the pack. As the sheets become stacked below the separating strips, the latter are pushed upwards, the assembly of articulated levers rises, and the arms 19 are lifted from the stops 28. When the strips 24 contact the lower portion of the fingers 35, the jack 36 is supplied and repels the fingers 35, entraining all the sheets

disposed above the strips 24 in the direction of the evacuating conveyor 11. In this movement, which is shown in FIG. 4, the fingers 35 of the pusher are not in contact with the first sheet of the pack which is to remain in place, but slide over the strips 25 which separate them therefrom. Moreover, by their own weight and the weight of the lever assembly which supports them, the strips 24 retain in place the lower portion of the stack, which therefore remains unaffected by the operation of evacuating the upper portion. After the upper pack has been evacuated, the two jacks 25, 36 are retracted, returning the pusher 35 and the set of strips 34 into the rear position, and once the assembly of strips 24 have been disengaged from the top of the stack they drop back into their bottom standby position, as shown in FIG. 1, their bottom position being determined by the stops 28 which limit the dropping of the arms 19.

The vertical position of the pusher finger 35 is so regulated as to enable the separating strips to make a cyclic movement, i.e. the evacuating movement by the pusher for sheets corresponding to the number selected per pack, so as to release the separating fingers at the required moment to allow them to return and separate two other packs.

The foregoing description is of course given merely by way of example and could be modified in detail without exceeding the scope of the invention. For instance, the jacks controlling the separating strips or the pusher can be hydraulic. The counting device can also use a photoelectric cell or even a mechanical device. The plate forming the stacking stop can also be independent of the frame of the evacuating conveyor.

I claim:

1. An apparatus for separating and evacuating sheet products to produce formed packs by stacking from below,

the sheet products being squared by reciprocating pallets and evacuated on to a conveyor belt, comprising a set of horizontal separating strips, an assembly of articulated levers supporting said strips and moving said strips beneath the lower portion of a pack in course of formation for free vertical movement of said strips and of the formed pack; means for moving said levers and for moving said separating strips; an evacuating pusher, vertical bars for said pusher each disposed above one of said separating strips; means for moving said pusher; and a sheet-counting device first actuating said means for moving said levers and said separating strips, inserting said strips beneath a predetermined number of sheet products in the formed pack and then actuating said means for moving said pusher when said strips engage said bars, said strips remaining between the formed pack and the top sheet of the next pack during evacuation of the formed pack.

2. A separating apparatus as set forth in claim 1, said means for moving said levers and said separating strips being a pneumatic jack.

3. A separating apparatus as set forth in claim 1, said means for moving said levers and said separating strips being a hydraulic jack.

4. A separating apparatus as set forth in claim 1, said means for moving said pusher being a pneumatic jack.

5. A separating apparatus as set forth in claim 1, said means for moving said pusher being a hydraulic jack.

6. A separating apparatus as set forth in claim 1, including an ultrasonic cell controlling said counting device.

7. A separating apparatus as set forth in claim 1, including a photoelectric cell controlling said counting device.

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