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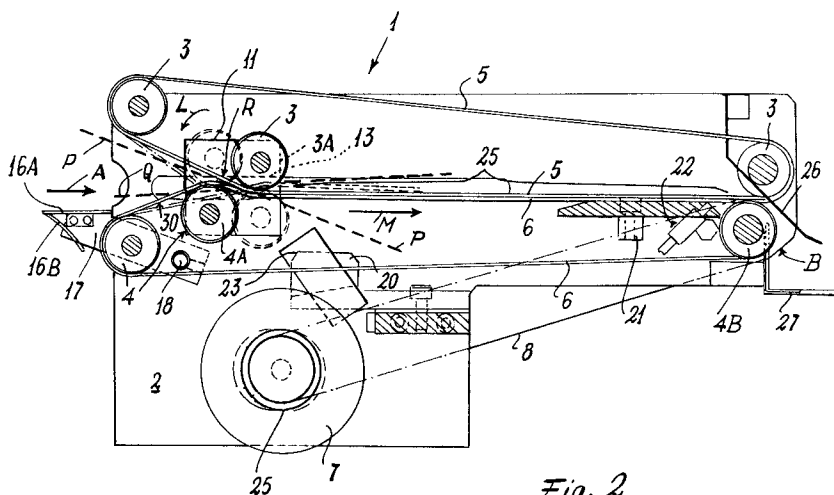
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(54) **Device for conveying sheets in general, in particular preprinted documents such as cheques, and for accumulating them into blocks.**

(57) A device for conveying sheets in general, in particular preprinted documents such as cheques, and accumulating then into blocks, comprises at least one pair of mutually cooperating, opposing conveyor belts (5, 6) each associated with guide and drive rollers (3, 3A, 4A, 4B), said rollers having parallel axes of rotation. The device also comprises at least one means (7) for driving said belts (5, 6) stepwise and at a first continuous speed and at a

second speed different from the first. At least two of said rollers (4A, 3A), one for each belt (5, 6) of said pair, are provided in proximity to the entry mouth (A) of the device and have their axes of rotation arranged in succession in the direction (M) in which the sheets advance within the device, and lying in a plane inclined to the plane within which said sheets move within the device.

*Fig. 2***EP 0 560 032 A1**

This invention relates to a device for accumulating sheets in general, in particular preprinted documents such as cheques, and for conveying them from a first handling station to another.

Machines have been known for some time which, starting from a continuous strip on which a plurality of documents such as cheques are printed, cut the individual documents from the strip, group them into blocks and assemble these latter in the required manner, for example by stapling and/or taping them.

These known machines comprise a cutting station into which the continuous strip is fed, and which delivers the individual documents at its exit. These then pass one after the other onto a conveyor belt moving at constant speed, and which after a certain distance causes them to fall one onto the other in an accumulation station, to form blocks of documents. These blocks then pass to a sorting station and from there to a block assembly and finishing station.

One of the factors most affecting the total time employed by the machine in forming a finished block, ie stapled and possibly taped, is the time the machine takes for accumulating the individual documents into blocks and transferring them to the sorting station.

In addition, the printed documents are generally numbered in sequence on the continuous strip. To obtain blocks numerically arranged in a decreasing direction (with the top document having the lowest number), that end of the strip containing the document with the highest number has to be inserted into the machine. To obtain blocks with the reverse numerical order that end of the strip containing the document with the lowest number has to be inserted. Compared with the first case, the blocks obtained are not only numbered inversely but are also rotated through 180°, ie in the first case a given side of the blocks, for example that to be stapled, is in a first position relative to the accumulation station whereas in the second case the same side is in a second position rotated through 180° from the first.

This means that the subsequent block assembly stations have to be repositioned, for example the stapling station has to be moved.

This moving and repositioning of said assembly stations is complicated and involves a considerable time during which the machine remains inoperative, with consequent financial loss due to the lost production.

An object of the present invention is to provide a device for conveying sheets, in particular preprinted documents, and accumulating them into blocks which reduces the time required for accumulating said documents into blocks, and which in the case of sequentially numbered sheets is able to assemble

blocks arranged either in decreasing or increasing order while in both cases maintaining the position of the sides of the block unchanged so that the subsequent block assembly stations do not have to be moved.

A further object is to provide a device of the aforesaid type which is of reliable operation and of low cost.

These objects are attained by a device in accordance with the accompanying claims, as will be apparent to the expert of the art.

The present invention will be more apparent from the accompanying drawings, which are provided by way of non-limiting example and in which:

Figure 1 is a schematic partly sectional top view of the device according to the invention;

Figure 2 is a section through the device of the invention taken on the line 2-2 of Figure 1.

The device 1 according to the invention comprises two side walls 2 with which mutually parallel upper rollers 3 and lower rollers 4 (Figure 2) are associated for supporting and guiding mutually cooperating opposing upper belts 5 and lower belts 6 respectively, and a drive member 7 connected in the illustrated embodiment via a usual belt 8 to a lower roller 4B (Figure 2) so as to drive said upper belts 6 and lower belts 5, these latter being dragged by the lower belts by friction.

The support and guide rollers for the belts 5 and 6, which are located at the ends of these belts, are associated in conventional manner with the side walls 2 of the device, for which the rollers comprise end journals 9 (Figure 1) cooperating with bearings 10 housed in seats provided in the wall.

The journal 10A associated with one end of the roller 4B driving the lower belts 6 comprises a portion projecting beyond the outer face of the side wall 2, and to which a pulley 24 is connected (Figure 1), cooperating with the belt 8 of the electric motor 7. This latter is advantageously of stepping type and comprises a coaxial position encoder 25 (Figure 2). The guide rollers 3A and 4A (Figure 2) are not associated directly with the walls but instead have their ends each associated with a support element 11 fixed by screws 12 to a block 13 which is inserted into and can slide within a slot (Figure 2) provided in the walls 2 substantially parallel to the direction M in which the documents advance within the device.

The block 13 and support element 11 are penetrated by the stem of a retaining member 15, the head of which rests against the outer face of the wall 2.

By loosening the retaining member 15 the support elements 11 and hence the rollers 3A and 4A can be shifted along the walls 2, and by tightening it said rollers can be retained in the desired position.

It should be noted that the two rollers 4A and 3A are positioned one following the other, and hence with the lower roller 4A preceding the upper roller 3A (as shown in Figure 2), or vice versa (as shown by dashed lines in Figure 2). In either case the rollers are positioned at a distance apart such that the tangent touching the outer surfaces of both rollers, indicated by the lines P and Q in the two respective cases, is inclined to the plane along which the documents move within the device, ie inclined to the portion, indicated by 25 in Figure 2, in which the belts 5 and 6 are superposed and in mutual contact.

In proximity to the entry mouth A of the device there are also provided two movable walls 16A and 16B (Figure 2) extending from one side wall 2 to the other and connected together to form a V-shaped element.

The ends of the walls 16A and 16B are associated with two levers 17 pivoted at 18 to the walls 2. One of the levers 17 is associated with a usual operating member 18, schematically illustrated in Figure 1 and comprising for example a pneumatic cylinder-piston unit.

Said lever system 17, 18 is arranged to move the walls 16A, B from a first position (shown in Figure 2), in which the wall 16A is substantially parallel to the plane in which the documents move within the device, to a second position in which the wall 16A is substantially perpendicular to said movement plane, so that the wall 16B deviates the documents arriving at the device towards a collector (not shown but of conventional type) positioned below the device (for this purpose the wall 16B is advantageously arched).

To the walls 2 there are also fixed below the belts 5, for example by screws 19 (Figure 1), two supporting cross-members 20, 21 to which usual sensors 22, 23, preferably of fibre optic type, are fixed to sense the presence of documents on the overlying belts 5.

In proximity to the exit mouth B of the device there is also fixed to the walls 2 a cross-member 28 to which a plurality of guides 26 for the documents leaving the device are fixed (Figure 2), to direct them towards a collection surface 27 fixed to said walls.

The device also comprises a usual control unit, advantageously of microprocessor type, connected to the sensors 22, 23 and to the encoder 25 to control the operation of the drive member 7 for the belts 5 and 6 and the operating member for the lever 17 associated with the walls 16A and 16B.

The documents (not shown) are fed to the mouth A of the device 1 according to the invention by a preceding document handling station (not shown). The documents can be fed in one or more parallel columns, depending on the dimensions of

the device according to the invention. Guided by the wall 16A, which initially is in the position shown in Figure 2, the documents arrive on a first part 30 (Figure 2) of the lower belts 6, to then reach a gripping point (indicated by R in Figure 2) at which the belts 5 and 6 make contact with each other.

The distance of said document "gripping" point R from the entry mouth A of the device can be varied by moving the guide rollers 4A and 3A closer to or further from the entry mouth. To achieve this the support element 11 (Figure 1) with which the rollers 4A and 3A are associated is moved until the gripping point R lies at the desired distance front the entry mouth.

It should also be noted that because of the particular arrangement of the guide rollers 4A and 3A, as soon as a document reaches and begins to exceed the gripping point R, the document, retained by the belts 5 and 6 initially lies in the same direction as these latter, ie in the direction of the line P or the line Q (Figure 2) depending on whether the guide roller 4A precedes or respectively follows the roller 3A (with respect to the direction of advancement of the documents, indicated by the arrow M in Figure 2).

That document portion which has not yet been gripped by the belts 5 and 6 is therefore either raised above the lower belts 6 (if the document moves in the direction P) or remains adhering to said belts (if the document moves in the direction Q).

On feeding the next document while the final part of the preceding document is still either raised above the lower belts 6 or adhering to said belts, said next document becomes positioned partly below or partly above the preceding document.

In this manner an overlapping of the documents fed to the device of the invention is achieved by under-positioning or over-positioning. During this initial document overlapping stage, the control unit acts on the drive member 7 to advance the belts 5 and 6 regularly but stepwise, to enable a document to be positioned below or above the preceding document. The speed of advancement of the belts to effect said overlapping is related to the speed with which the documents, originating from a preceding handling station, are fed to the device. The control unit controls the rate of advancement of the belts on the basis of this feed speed. If the feed speed is constant it is keyed into the control unit by the user via an interface connected to said control unit, whereas if variable it is measured by sensors of conventional type (not shown) positioned downstream of the device and connected to said control unit.

In addition, by means of said interface connected to the control unit, the user can adjust the extent of overlap, ie the amount of the document

which is not retained between the belts below or above which the next document is inserted. In this case the user varies the speed of advancement of the belts. The encoder 25 associated with the motor 7 provides the control unit with a signal for controlling the movement of the conveyor belts 5 and 6.

On conclusion of the feed cycle by the cutting station, the control unit causes the belts 5 and 6 to advance continuously at a speed much higher than the "overlapping" speed so as to quickly discharge the documents present on the portion 25 (Figure 2) of the belts 5 and 6, one on the other in the order of overlap, onto the wall 27 in proximity to the device exit mouth B. The device sensors 22 and 23 indicate when the discharge cycle is complete. During the discharge of the documents present in the device, no new documents are fed to the device.

To prevent accidental feed of documents to the device, the control unit provides a suitable signal to activate the operating member associated with the lever 18 (Figure 1) controlling the movement of the movable walls 16A and 16B (Figure 2), so that the wall 16B rises to prevent the documents entering the device entry mouth A but instead guides them towards an underlying container (not shown).

As stated, the documents entering the device can be overlapped by under-positioning or over-positioning, depending on whether the roller 4A precedes or follows the roller 3A. To invert the rollers, it is necessary only to rotate the support element 11 with which the rollers are associated, through 90° in the direction of the arrow L (Figure 2).

Hence from the foregoing it is apparent that the device according to the invention enables numbered documents to be accumulated into blocks in an ordered arrangement either in the increasing or decreasing sense, to obtain blocks which are equally positioned in both cases, rather than with their sides rotated through 180° as in the case of traditional machines.

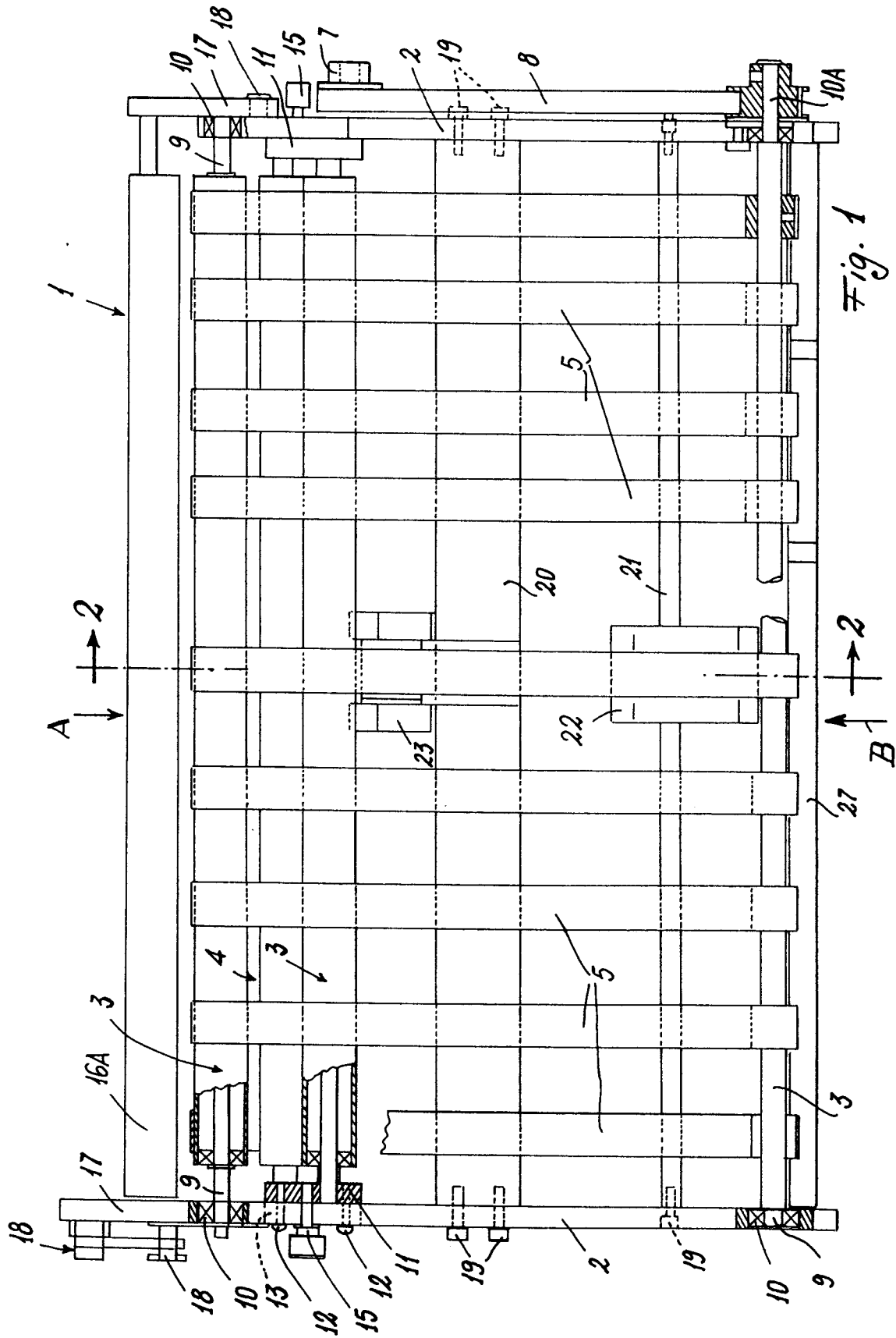
The device of the invention has also proved more rapid than known devices in forming blocks of documents.

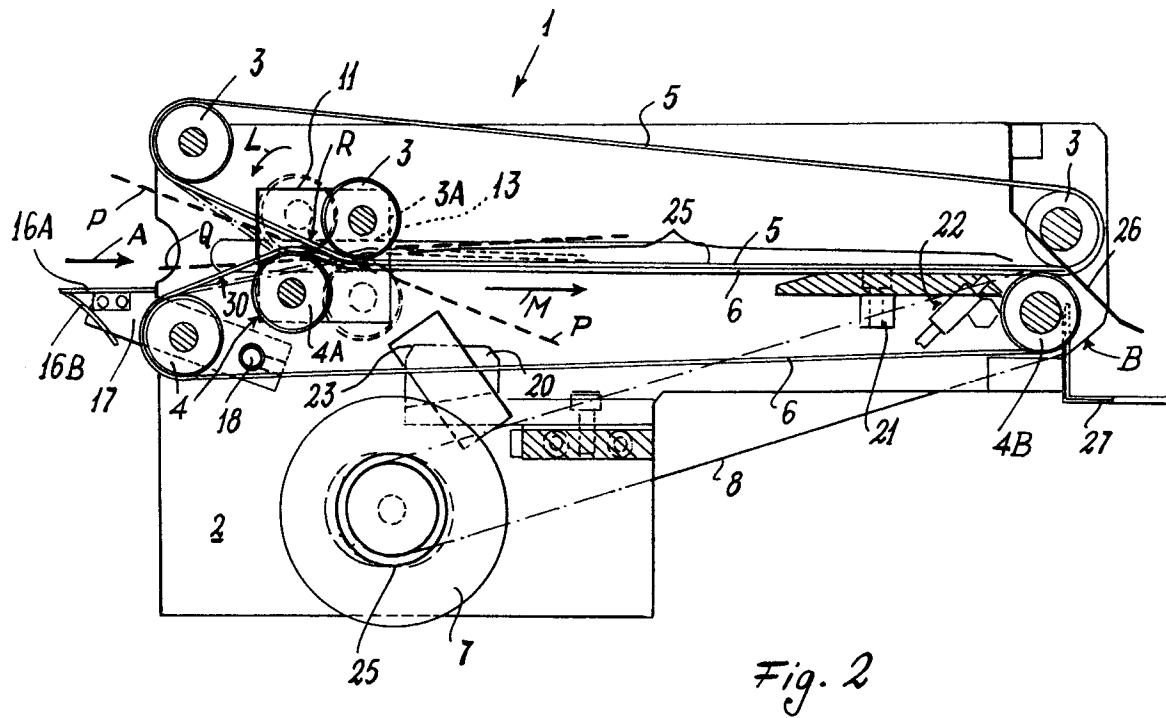
Claims

1. A device for conveying sheets in general and accumulating then into blocks, characterised by comprising at least one pair of mutually cooperating, opposing conveyor belts (5, 6) each associated with guide and drive rollers (3, 3A, 4A, 4B), said rollers having parallel axes of rotation; and by comprising at least one means (7) for driving said belts (5, 6) stepwise and at a first continuous speed and at a second

speed different from the first, at least two of said rollers (4A, 3A), one for each belt (5, 6) of said pair, being provided in proximity to the entry mouth (A) of the device and having their axes of rotation arranged in succession one after the other in the direction (M) in which the sheets advance within the device, the axes of said rollers lying in a plane inclined to the plane within which said sheets move within the device.

2. A device as claimed in claim 1, characterised in that said at least two rollers (4A, 3A) with their axes of rotation arranged in succession and lying in a plane inclined to the plane in which said sheets move within the device are movably supported on the walls (2) which support the device, so as to be able to vary the distance of said two rollers (4A, 3A) from the entry mouth (A) and to vary the order of succession of said rollers.
3. A device as claimed in claim 1, characterised by comprising at least one wall (16A, 16B) in proximity to the entry mouth (A), said wall being able to assume at least two positions such as to guide the documents towards said belts (5, 6) or towards a separate container.
4. A device as claimed in claim 3, characterised in that said at least one wall (16A, 16B) is associated with a lever (17) and an automatic operating member arranged to move the wall into said two positions.
5. A device as claimed in claim 1, characterised by comprising at least one sensor (22, 23) for sensing the presence of documents between said belts (5, 6).
6. A device as claimed in claim 5, characterised in that one of said sensors (23) is provided in proximity to the entry mouth (A) and one (22) in proximity to the exit mouth (B) of the device.
7. A device as claimed in claim 1, characterised by comprising at least one drive member (7) associated with at least one of said drive and guide rollers (4A) and incorporating a position encoder (25).
8. A device as claimed in claim 1, characterised by comprising a control unit of microprocessor type.







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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 1231

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 805 891 (PITNEY BOWES) * the whole document * ---	1	B65H29/66
X	US-A-1 819 841 (HUDSON) * the whole document * ---	1,2	
A	US-A-2 133 727 (G. STAUDE) ---		
A	US-A-1 986 023 (G. STAUDE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 MAY 1993	Examiner LONCKE J.W.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			