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(54) APPARATUS FOR SORTING AND COLLECTING  
COPY SHEETS

(71) We, OCE-VAN DER GRINTEN N.V., a Limited Liability Company organised and existing under the Laws of the Kingdom of the Netherlands, of Venlo, The Netherlands, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to apparatus for sorting and collecting copy sheets, such as those which emerge from a copying apparatus, the device comprising a frame, a transport mechanism in the frame for transporting sheets along a substantially vertical path which is e.g. fed from the copy-ejection part of the copying apparatus, a plurality of substantially horizontal bins situated along the path of movement of the sheets, supported by the frame mentioned, and guide elements which can be brought into the path of movement of the sheets to be sorted.

Devices of this kind are generally known in which the device is coupled as a separate unit to the copying apparatus. In general this means that the device takes up floor space, and furthermore the installation is such that its operation cannot be observed directly from the normal working position of the operator.

Our copending Application 9212/77 (Serial No. 1574521), from which this Application is divided, describes and claims apparatus comprising a copier and a device for sorting and collecting copy sheets, the device comprising a frame, a transport mechanism in this frame for transporting sheets along a substantially vertical path which is fed from the copy-ejection part of the copier, a plurality of substantially horizontal bins, situated along the paths of movement of the sheet, which bins are supported by the frame, and guide elements

which can be brought into the path of movement of the copy sheets to be sorted to direct them into their respective bins wherein the device is situated above the working surface of the copying apparatus and is supported by this, and seen from above, in the operative position lies wholly within the horizontal outline of the copier.

The present invention provides apparatus for sorting and collecting sheets, e.g. for use as such a sorting and collecting device, comprising a frame in which at least one series of adjacent bins is installed, transport elements for transporting the sheets to be sorted one by one along a path extending near the bins, and guide elements which can be brought into the path of movement of the sheets to be sorted, whereby each guide element is movable between two positions, a first position in which the guide element extends into the path of movement of the sheets to intercept a sheet moving along that path and guide that sheets into its respective bin, and a second position in which the guide element is situated out of the path of movement of the sheets, and wherein each guide element is brought from the first to the second position by depositing a sheet into the corresponding bin, wherein the first position of each guide element is the only stable position of equilibrium thereof, and wherein each guide element is provided with a latching element adapted, after the guide element has been brought to the second position, positively to latch the guide element in the second position.

In known apparatus of this type, both the first and the second positions of the guide elements are stable positions of equilibrium. The transition from the first to the second requires a quantity of energy, which is supplied by the kinetic energy of the sheets to be sorted. The opposite transition however requires only a small quantity

of energy, which means that as a result of vibrations, shocks or impact a guide element can return to the first position at an undesired moment, by which the sorting  
 5 is disturbed in such known apparatus. By providing that the first position of each guide organ is the only stable position of equilibrium, and latching the guide  
 10 elements positively, it is achieved that the guide elements do not move at an undesired moment from the second to the first position as a result of shocks or impacts on the apparatus.

Other advantages will become clear from the following description of an exemplary embodiment in which reference is made to the accompanying drawings, in which:

Figure 1 is a front view of a copying apparatus provided with a sorting apparatus  
 20 according to the invention;

Figure 2 is a top view of the apparatus of Figure 1;

Figure 3 is a section according to the line III-III in Figure 2;

25 Figure 4 is a section according to the line IV-IV in Figure 3;

Figure 5 is a section according to the line V-V in Figure 4, with the guide element in the first position;

30 Figure 6 is a section as in Figure 5, with the guide element in the second position, and

Figure 7 is a section according to the line VII-VII in Figure 4.

35 In the Figures 1 and 2 a copying device 10 is represented, for instance of the type such as described in more detail in Published Dutch Patent Application 72 05 491. On line copying device 10, near the ejection opening for the copies made, a sorting  
 40 device 20 according to the invention is installed. The sorting device 20 comprises a transport section 21 and a sorting box 22. The transport section 21 is of the type  
 45 as described in British Patent Specification 1486166 comprising a suction box in combination with a number of transport belts. The complete sorting device 20 rests via  
 50 section 21 on the frame of the copying apparatus 10.

As appears clearly from Figure 2, the position of the device has been arranged in such a way, that the sorting box 22  
 55 is situated above the working plane of the copying apparatus 10 and that the sorting device 20 is supported via the transport part 21 by the copying apparatus 10. In the horizontal plane the sort device 20 thereby  
 60 fully lies within the circumference of the copying apparatus 10.

The sorting box 22 is built up of a frame comprising three vertical bars 30, 31 and 32 (see Figure 4) of which the bars  
 65 30 and 31 are interconnected at top and

bottom by horizontal bars 33 and 34 (see Figure 3) which in their turn are connected almost in the centre with the top and bottom of bar 32 by means of horizontal bars 35 and 36 respectively. 70

The frame thus formed is fixed via bar 30, of which the ends are provided with pins which cooperate with holes in brackets 37 and 38, to the transport section 21 and is connected with this in a hinging  
 75 way, whereby, as represented in the position drawn in full lines in Figure 2, the plane formed by the bars 30, 31, 33 and 34 is situated near and parallel to the transport path for the copies in the trans-  
 80 port section 21. In the opened position drawn in Figure 2 in dashed-dot lines, the transport path in the transport section 21 is freely accessible, so that in case of jamming the sheets can easily be removed. 85

The placing of the hinge shaft thus chosen, determined by the holes in the bracket 37 and 38, makes it possible to open the sorting device 20, even when the copying apparatus 10 is installed with one  
 90 side against a wall, or in a corner.

The sorting box 22 is kept in the closed or active position by means of a permanent magnet 39, which is fixed on bar 33, while moreover provisions have been made,  
 95 for instance in the form of a microswitch, to stop the transport section as soon as the sorting box is opened.

From the preceding it follows, that the good operation of the sorting device can  
 100 easily be checked visually as the sorting box is situated in front of the operator at eye level. Moreover any troubles may easily be eliminated as it is hardly necessary for the operator to move position. 105

Against each of the facing sides of the bars 30 and 31 a U-section bar 40, 41 is fixed, and an identical section bar 42 is fixed on that side of the bar 32 which faces the transport section 21 in the closed  
 110 position (see Figure 4). The flanges of each U-section bar 40, 41 and 42 are provided with regularly spaced recesses in the form of saw cuts. In each set of recesses lying in a horizontal plane a plate 45 is installed  
 115 with a general shape as shown in Figure 2. In this way a number of plates 45 are installed in a vertical stack, which plates serve as bins or receiving trays of the sorting device. In order to retain the bins,  
 120 an L-section bar 46, 47 is fixed on that side of each bar 30, 31 which in the closed position faces the transport section.

Below each bin 45 a strip 48 is fixed, which seen from the transport section  
 125 obliquely extends backwards and downwards as far as the next bin. This strip 48 serves for braking and stacking the sheets to be deposited in a bin.

That edge of each bin 45 which in the 130

closed position faces the transport section 21 is provided with a recess 50, and also two flanges 51 and 52, extending vertically upwards (see Figure 4) and two flanges 53 and 54 extending vertically downwards (see Figure 3). The flanges 51 and 52 prevent, sheets deposited in a bin 45 falling out of this in the direction of the transport section 21. The flanges 53 and 54 have their flat sides facing, and are each provided with a hole in which a shaft 55 is rotatably mounted.

On each shaft 55 a guide element 60 is fixed. Each guide element comprises an L-section bar 61, which extends parallel to the shaft 55, two end-flanges 62, 63, which form a whole with the L-section bar 61 and which are fixed on the shaft 55, three evenly spaced deflector blades 64, 65 and 66, which are also integral with the L-section bar 61 and a number of arms 67 which give a proper distribution of weight to the whole element.

Each guide element 60 cooperates with a latching element 70 which is fixed on each bin 45 near the bar 31. The latching element 70 comprises a holder 71 which at its upper side is provided with a longitudinal recess open at one side, in which a blade spring 72 is installed whereby holder and blade spring are together fixed, for instance by means of screws 73 and 74 on the upper side of the bin 45; the blade spring 72 extends almost up to the shaft 55.

The construction is arranged in such a way, that the active position of the guide element 60, is the position in which the guide element extends into the transport path of the sheets to be sorted, which position, as a result of the arms 67, is the only free position of equilibrium of the guide element. The blade spring 72 rests on the upper side of the vertical leg of the L-section bar 61. When as a result of the deposition of a sheet in a bin, which sheet thereby pushes against the arms 67, the guide element 60 is moved into the position drawn in Figure 6, the blade spring 72 takes up a position behind the top of the vertical leg of the L-section bar 61 and the free edge of the blade spring 72 comes to lie in a groove formed in that leg, so that the guide element is latched in this position. In this position, sheets being transported in the transport path can freely pass the guide element.

In order to return a guide element to its active position, as shown in Figure 5, an unlatching device is installed, comprising a rod 80, extending over the height of the sorting device and along the blade springs. On this rod 80 a small shaft 81 is fixed per latching element each of which small shafts 81 extends below the blade

spring 72 of the respective latching element 70. When the rod 80 is moved upwards, all blade springs 72 will also be moved upwards and will come out of the groove in the L-section bar 61, by which all guide elements 60 can return to their natural position of equilibrium, which corresponds with the active position. It should be noted that the guide element belonging to the uppermost bin is always kept in the active position.

As seen in Figure 7, for moving the rod 80 upwards an opening 82 is made near its lower end, in which opening one end of a tumbling lever 83 extends which, via a shaft 84, is rotatably installed on the bar 34. The other end of the tumbling lever 83 is connected with the armature of a lifting solenoid 85 which is also fixed against the bar 34. The lifting solenoid 85 is electrically connected with the start button of the copying device 10, coupled with the sorting device 20, in such a way, that the lifting solenoid 85 is excited in synchronisation with the operation of the start button and as a result of this brings all guide elements in the active position.

The operation of the sorting device is as follows: When the copying run of a first original is started, whereby the lifting solenoid 85 is excited, by which all guide elements 60 are brought into the active position, the first copy arrives in the sorting device 20 in course of time, and this will be deposited in the lowest bin 45 by the guide element 60 belonging to this lowest bin 45. As a result of the laying down of that copy the guide element 60 is turned about the shaft 55 and is latched by the blade spring 72 into the non-active position. Consequently the second copy is then deposited in the second lowest bin, and so on. When the original is exchanged, the start button of the copying device must again be operated, and the cycle is repeated, the first copy of the second original being then deposited in the lowest bin, the second in the next lowest, and so on.

Besides an on/off switch 91 on an operation panel 90 of the sorting device 20 a second switch 92 is installed, which enables an operation mode to be selected in which all copies are deposited in the lowest bin. This can be achieved by permanently exciting the lifting solenoid 85 by operating switch 92.

It is clear that the invention is not restricted to the embodiment described and represented, but that within the scope of the invention as defined by the claims numerous modifications can be made, in particular with regard to the construction of the latching element and the unlatching mechanism. Thus the blade spring 72 described can be replaced by a small

plate which is rotatably mounted at one end or unlatching can be effected by a descending movement of the rod 80.

WHAT WE CLAIM IS:—

- 5 1. Apparatus for sorting and collecting sheets, comprising a frame in which at least one series of adjacent bins is installed, transport elements for transporting the sheets to be sorted one by one along a path extending near the bins, and guide elements which can be brought into the path of movement of the sheets to be sorted, whereby each guide element is movable between two positions, a first position in which the guide element extends into the path of movement of the sheets to intercept a sheet moving along that path and guide that sheet into its respective bin, and a second position in which the guide element is situated out of the path of movement of the sheets, and wherein each guide element is brought from the first to the second position by depositing a sheet into the corresponding bin, wherein the first position of each guide element is the only stable position of equilibrium thereof, and wherein each guide element is provided with a latching element adapted, after the guide element has been brought to the second position, positively to latch the guide element in this second position.
2. Apparatus according to claim 1 and including a common unlatching means operative to bring all guide elements into their first position.
3. Apparatus according to claim 2, wherein operation of the common unlatching means release the latching of all the guide elements which are in the second position.
4. Apparatus according to any one of

the preceding claims, wherein the bins are installed substantially horizontally, and wherein for each bin the latching element comprises a pawl which with one end is connected hingedly with the frame of the device, and wherein the other end rests on a horizontal part of the guide element in its first position and cooperates in a latching way with a substantially vertical part of the guide element in the second position of the guide element.

5. Apparatus according to any one of the preceding claims, wherein the bins are installed substantially horizontally and wherein for each bin the latching element comprises a flexible strip clamped at one end to the frame and the other end of which rests on a horizontal part of the guide element in the first position thereof and which cooperates in a latching way with a substantially vertical part of the guide element in its second position.

6. Apparatus according to claim 2 and 4 or 5, wherein the common unlatching means comprises an axially movable vertical rod carrying a plurality of horizontal pins, each of which is arranged to lift the free end of the latching element during an upward movement of the rod to release that end from the substantially vertical part of the guide element.

7. Apparatus according to claim 1 for sorting and collecting sheets substantially as hereinbefore described with reference to the accompanying drawings.

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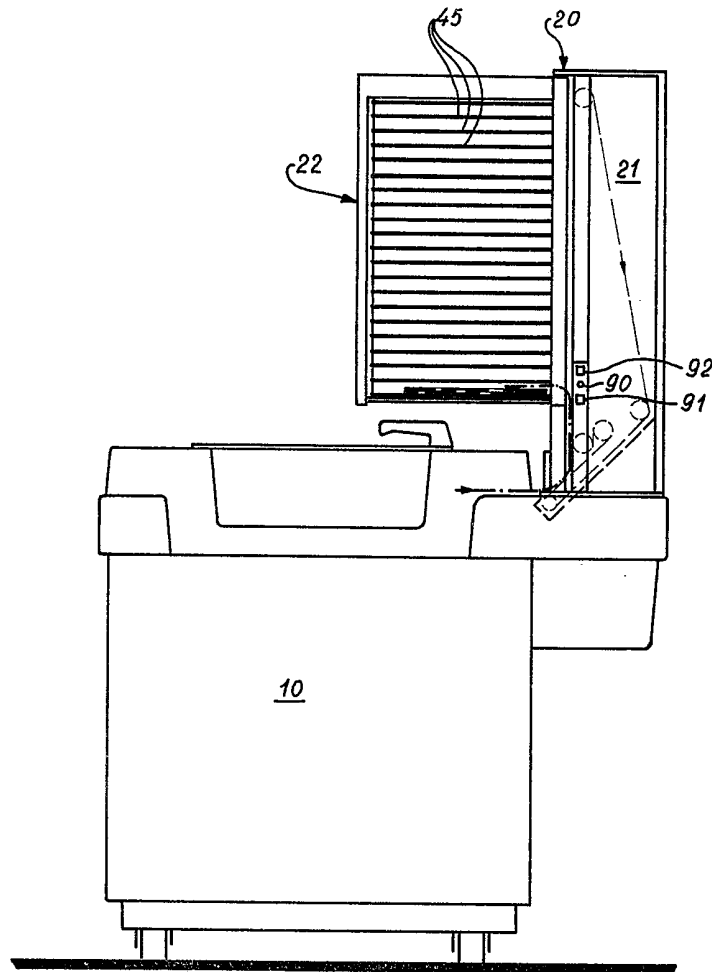


FIG. 1

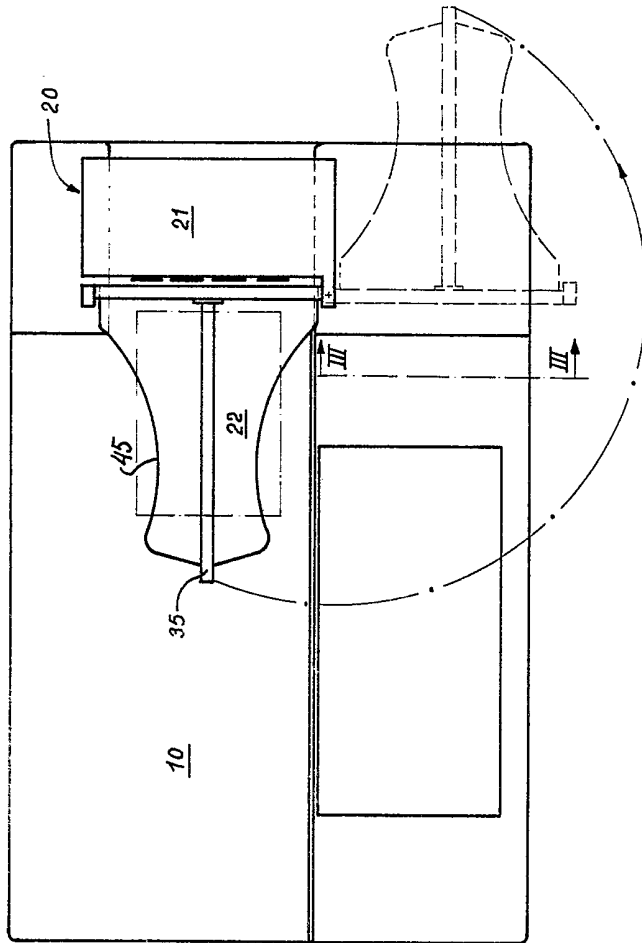


FIG. 2



