

[54] **DOCUMENT DEFLECTING AND STACKING APPARATUS FOR USE IN DOCUMENT SORTING**

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[51] Int. Cl.<sup>2</sup> ..... **B65H 29/60; B65H 31/10**

[58] Field of Search ..... **271/64, 220, 219, 217, 271/215, 214, 80, 182**

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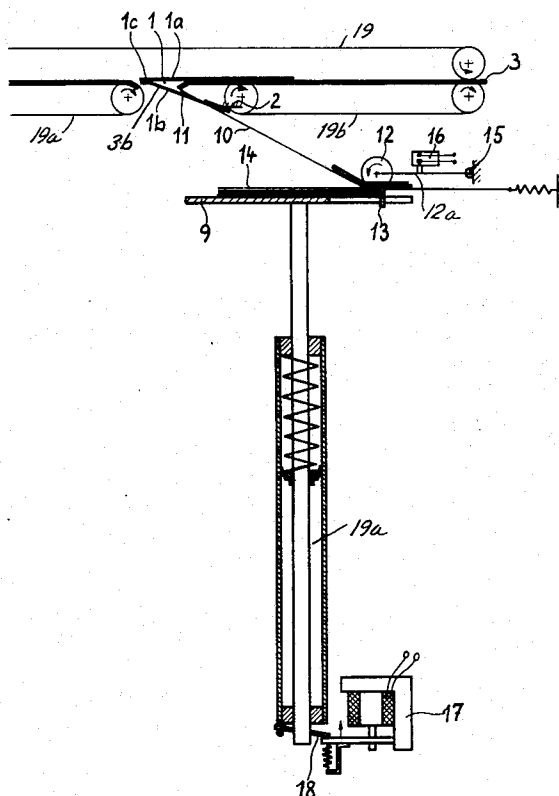
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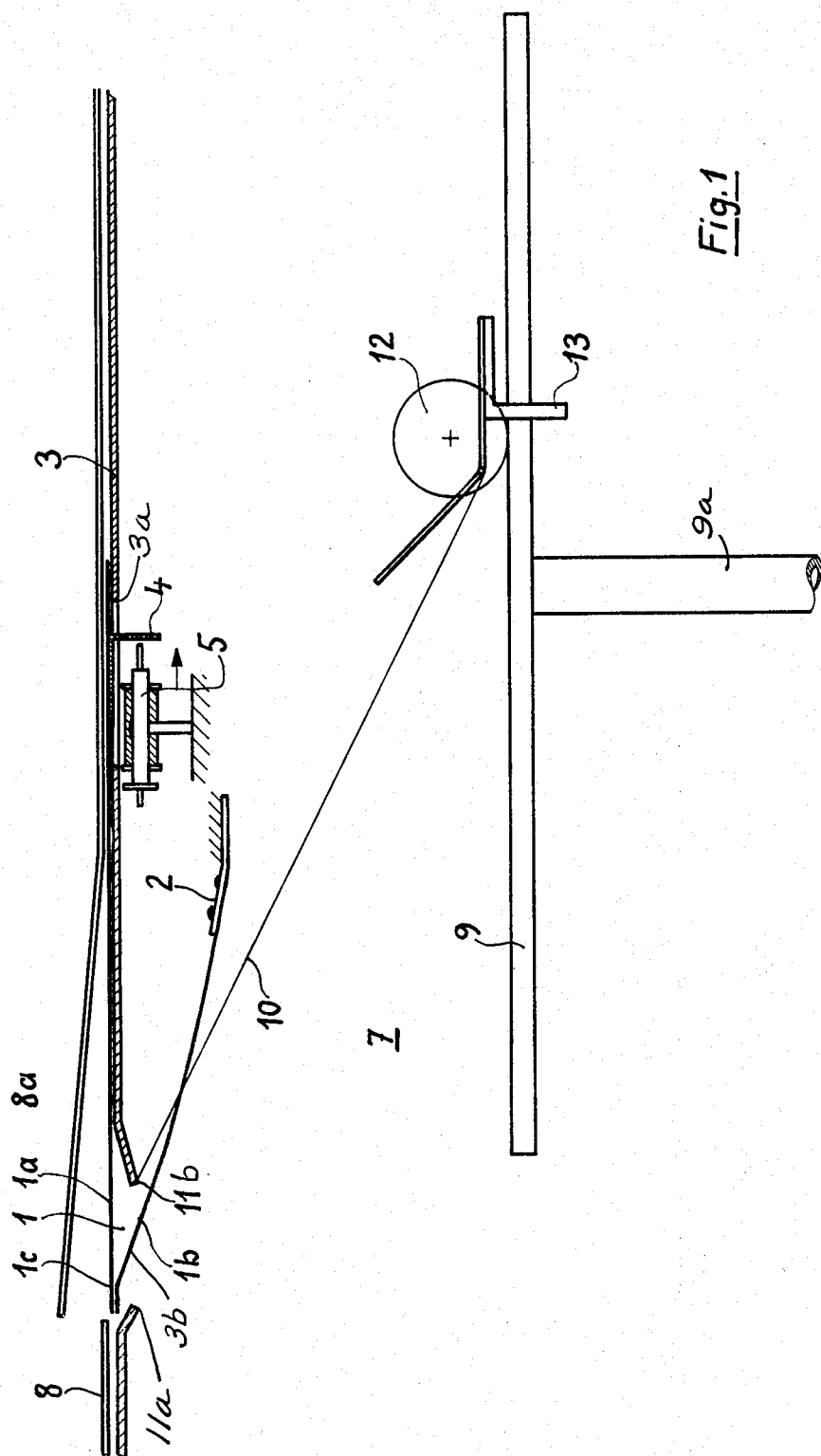
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[57] **ABSTRACT**

A document sorting apparatus in which documents are fed along a transfer table is provided with one or more switches for deflecting documents into collecting zones below the table. Each switch consists of two planar arms which intersect at an acute angle, one arm cooperating with the table to guide the documents and the other arm extending through an aperture in the table into engagement with a fixed mounting. Electromagnetic means are provided to move the first arm so that it no longer co-operates with the table and causes resilient deflection of the other arm so that it intersects the path of documents across the table and so deflects documents through the aperture. On deactuation of the electromagnetic means, the switch is returned to its nondeflecting condition as a result of the resilience of the second arm of the switch.

**1 Claim, 4 Drawing Figures**





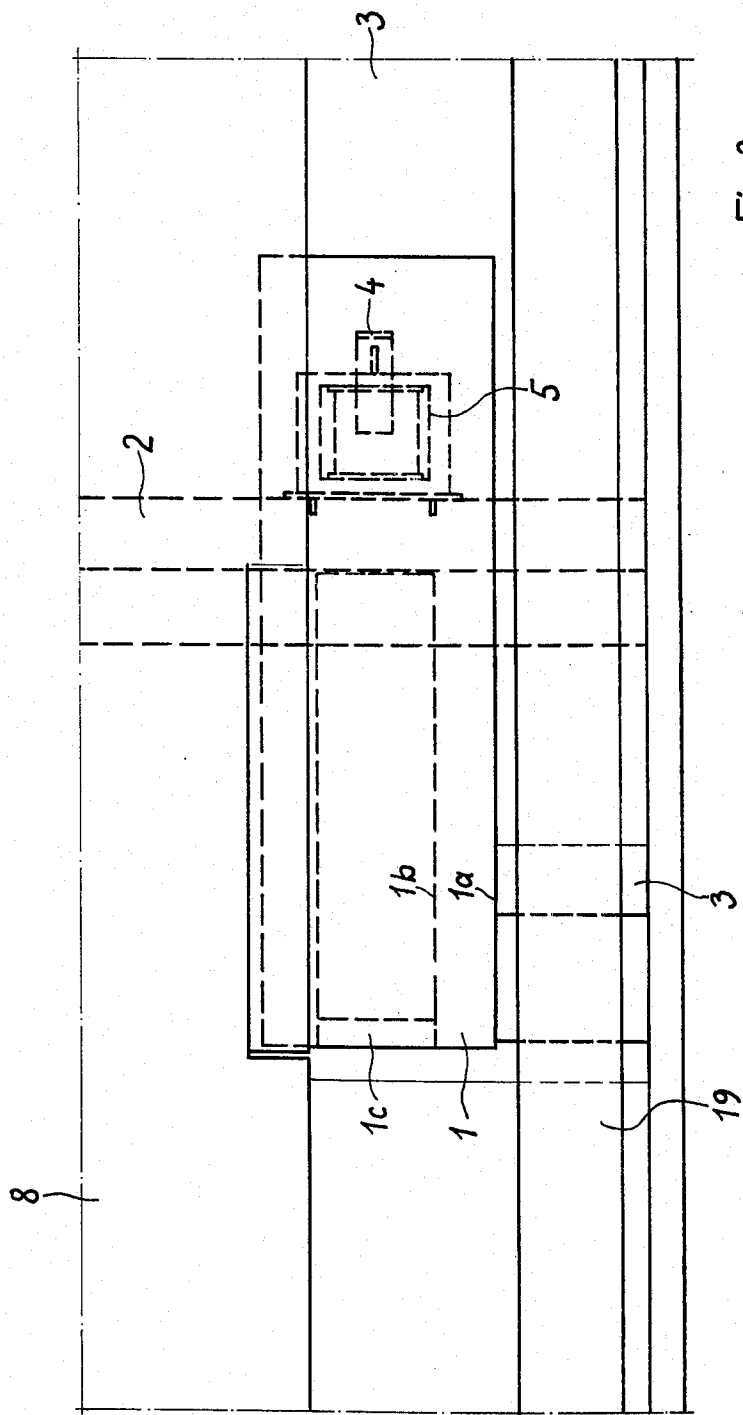


Fig. 2

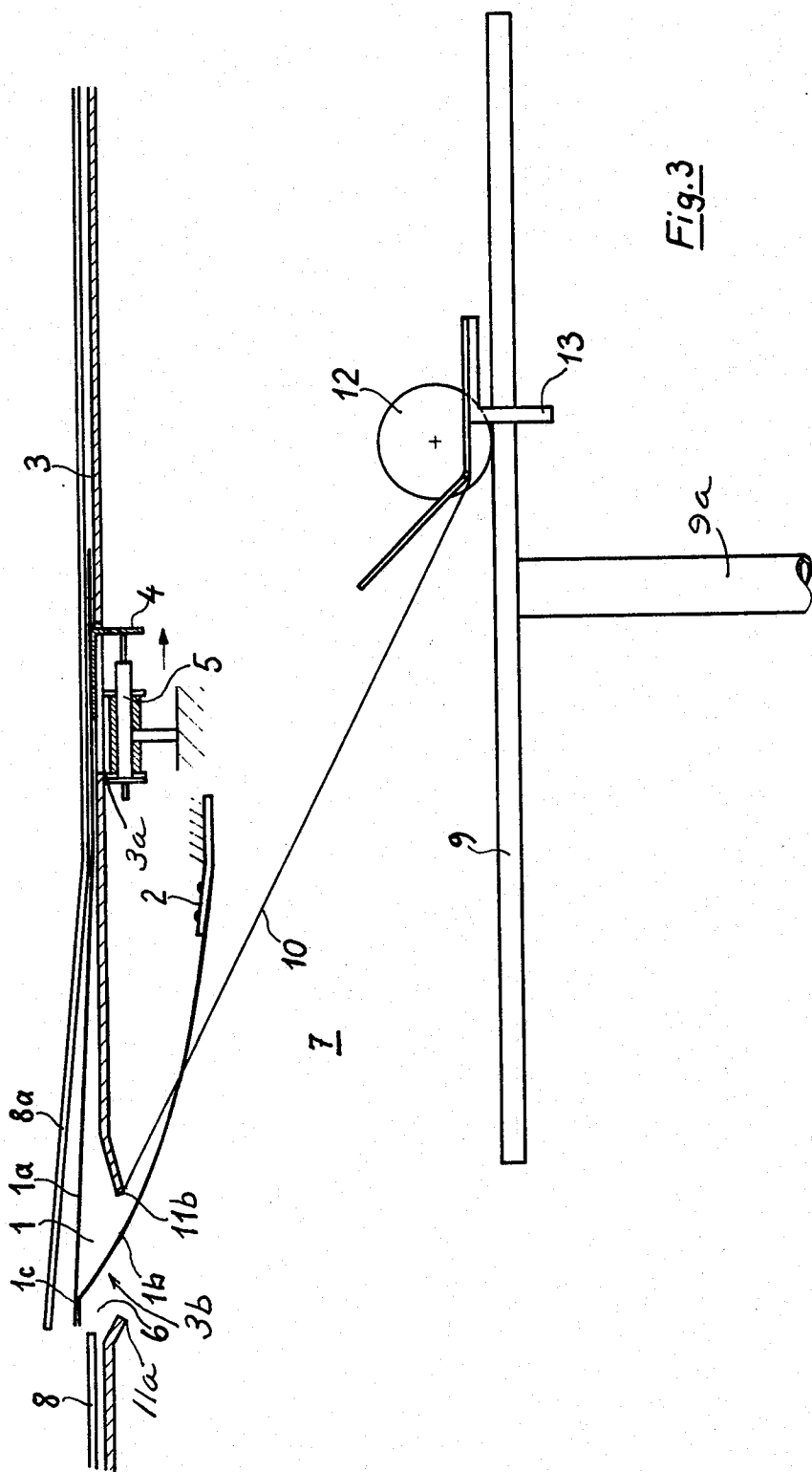
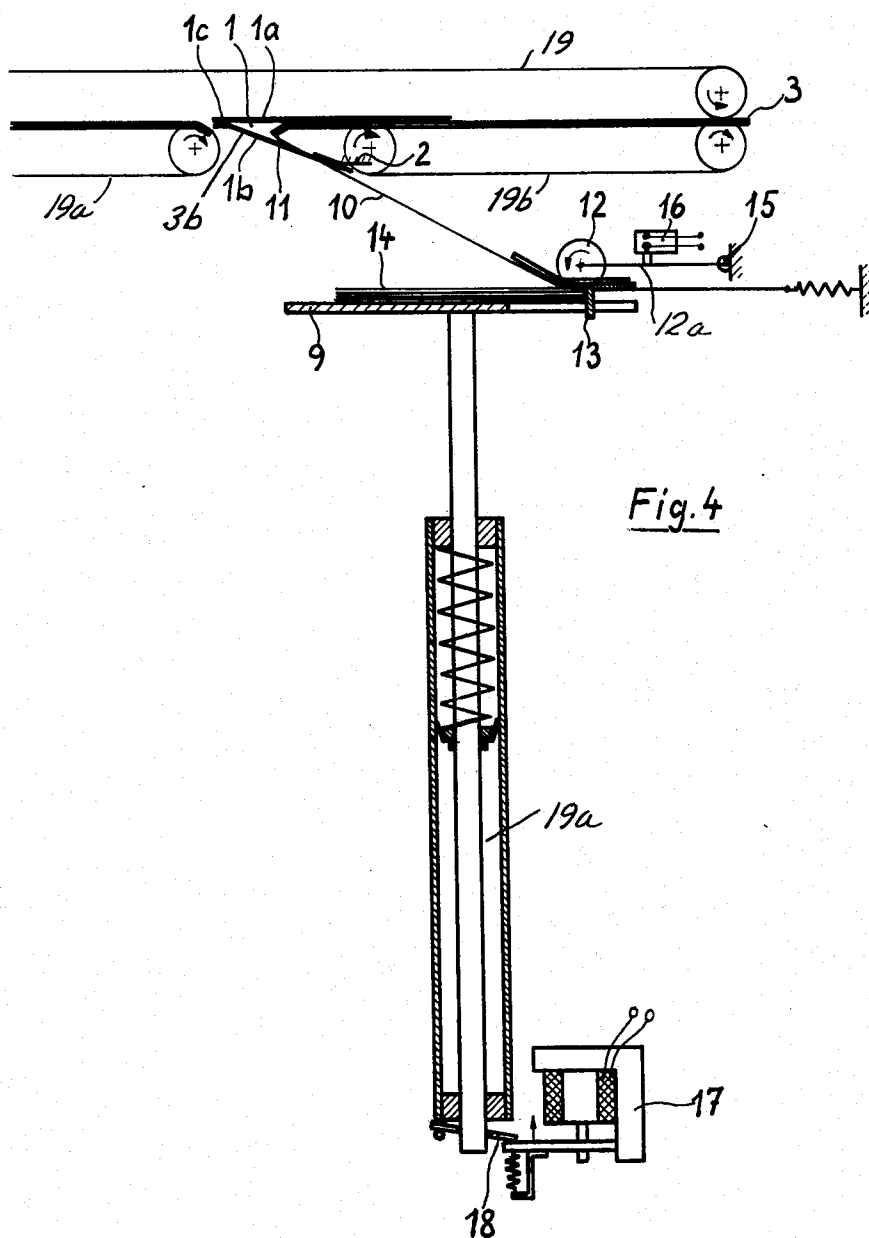


Fig. 3



## DOCUMENT DEFLECTING AND STACKING APPARATUS FOR USE IN DOCUMENT SORTING

### BACKGROUND OF THE INVENTION

The invention relates to a switch for deflecting pliable laminar objects such as sheets and leaves from one direction of motion into another.

In apparatus for the processing of documents such as vouchers, the individual documents moving along a prescribed path are deflected by switches of this kind into receiving compartments in which they are stacked in a more or less horizontal position. Pivotable or hinged switches are generally provided so that the switches may be moved between their deflecting and nondeflecting positions as a result of swivelling movement (accepted specification of German Pat. application No. 1,074,305 and provisionally published specification of German Pat. application No. 1,931,568).

A switch swivelling about a pivot has various disadvantages. Such a switch has to be mounted in a comparatively elaborate manner by means of a pivot pin or swivel bolt which is journaled in a swivel bearing. Upon even the slightest error in switching operation, the documents may get caught in the unavoidable gap between the circular swivel bearing and the adjoining surface defining the prescribed path of movement. When the documents are conveyed at a very high speed, the high switching frequency of the drive (2.4 to 7.4 times per second) may result in undesirable vibrations in the switch. In addition, the switch requires precision mounting.

### SUMMARY OF THE INVENTION

It is thus an object of the invention to simplify the switch and to improve the conveyance and delivery by avoiding the elaborate swivel bearing hitherto used.

In accordance with the invention, this object is achieved by providing a switch having two arms disposed at an acute angle to each other, one arm serving to define part of a prescribed path of movement when in a rest position and movable from that position by a drive, for example an electromagnetic drive, while the other arm, which is made of a flexible or springy material extends at an angle to the direction of conveyance and has one fixed end.

A switch such as this is of an extremely simple and reliably functioning construction. The resiliently flexible second arm which is bent upon displacement of the first arm from its rest position, serves simultaneously to provide a restoring and guide means for the return movement of the first arm to its rest position, and as the means by which the switch is secured and held in position, so that a swivel bearing may be dispensed with. The resiliently flexible second arm may comprise one or more parallel bars or rods or it may consist of a plate of spring material. The resiliently flexible second member may also serve as an additional guiding and deflecting element by which the documents to be sorted may be guided or deflected to a receiving compartment.

The first arm may be provided in the form of a laminar or areal carrier, for example: by a piece of sheet metal or by a sheet metal mesh, resting on guide means in the form of a transfer table for conveyance of the documents, one end of the resiliently flexible second arm being secured in position under the guide means. The two arms may be formed of spring strips, the first arm resting loosely on the transfer table for conveyance

of the documents and the end of the second arm being secured to the underside of the table, a switch of a particularly advantageous construction being thus obtained.

The drive used for moving the switch may engage the movable first arm in fundamentally different ways. In one preferred embodiment of the invention, the movable first arm is displaced by an electromagnetic device in the direction of the prescribed path past the switch, a simple space-saving construction being thus obtained. Passage across the switch may be further improved by providing a guide plate on one side of the switch, preferably on the side opposite the surface of a conveyor surface forming part of the guide means.

### DESCRIPTION OF THE DRAWINGS

The invention is hereinafter described with reference to the accompanying drawing, in which:

FIG. 1 is a part-sectional side elevation of part of a document sorting apparatus including a switch according to the present invention;

FIG. 2 is a plan view of the apparatus shown in FIG. 1; and

FIGS. 3 and 4 are enlarged side elevations of part of the apparatus shown in FIGS. 1 and 2, with the switch shown in the nondeflecting and deflecting positions, respectively.

### DESCRIPTION OF A PREFERRED EMBODIMENT

As shown in FIGS. 1 and 2, documents are conveyed along a transfer table 3 by means of an upper endless belt conveyor 19 and two lower endless belt conveyors 19a and 19b (FIG. 4), which cooperate to grip one edge of each document. The opposite edge of each document is guided between the transfer table 3 and a guide plate 8.

The switch 1 has first and second rectangular arms 1a and 1b which are inclined at an acute angle to each other and connected, by spot-welding or by an adhesive, along a joint 1c. In an alternative form of construction, the two arms 1a and 1b form integral parts of a single piece of strip material which is simply bent into a V-shape.

As shown in FIGS. 3 and 4, the first arm 1a is slidable on the transfer table 3 and movable from a rest position (FIG. 3) by means of an electromagnet (solenoid) having an axially movable core 5 which is operable to move an angle member 4 attached to the arm 1a and projecting through a first opening 3a in the transfer table 3. The second arm 1b is of resiliently flexible sheet material and extends through a second opening 3b in the transfer table 3 from the first arm 1a to a fixed support 2. Thus, on actuation of the electromagnet to move the first arm 1a from its rest position, the joint 1c performs an arcuate upward movement as a result of flexure of the second member 1b. To accommodate this movement of the switch 1, a portion 8a of the guide plate 8 overlying the switch 1 is bent upwards, away from the switch 1. The bent second arm 1b then intersects the path of documents moving across the transfer table 3 and diverts documents from this path through a gap 6 between the forward edge 11a of opening 3b and the second arm 1b, into a space 7 below the transfer table 3. As soon as the electromagnet is switched off, the second arm 1b straightens and so draws the first arm 1a back into its rest position so as to allow documents to pass right across the transfer table 3 (FIG. 1).

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Documents 14 diverted into the space 7 below the transfer table 3 are deposited on a piling platform 9 which is supported on a spring-loaded, telescopically mounted column 9a. To ensure neat piling of diverted documents 14, cords 10 are strung between the rear edge 11b of the second opening 3b in the transfer table 3 and a guide member 13 having a stop plate 13a. A positioning roller 12 is drivably mounted on the end of an arm 12a which is pivoted about a fixed axis 15 and rests on the piling platform 9 or on documents deposited on the piling platform 9 so that, on rotation of the positioning roller 12, the uppermost sheet is urged into abutment with the stop plate 13.

As the pile of documents 14 grows, the arm 12a swings clockwise around the fixed axis 15 to cause actuation of a switch 16 so that current is passed to an electromagnet 17 to lift a locking plate 18 engaging the column 9a. This allows the column 9a to fall under the weight of the documents 14 piled on the platform 9. As soon as the switch 16 is de-energized as a result of counterclockwise swinging movement of the arm 12a, current flow to the electromagnet 17 is interrupted and so the locking plate 18 falls under its own weight into locking engagement with the column 9a, and so prevents undue lowering of the platform 9.

By providing the switch 1 with a resiliently flexible arm 1b which serves to return the switch 1 to its non-deflecting condition whenever the switch 1 is in its deflecting condition, and also as a guide for documents deflected by the switch, an inexpensive, low-wear switch may be obtained and, even during high speed operation, this switch retains its full functioning capacity. A swivel bearing is no longer required. Losses due to friction, and expensive detachable accessories are avoided. Undesirable vibrations may be readily suppressed. Clearly, the transfer table 3 may be provided with a plurality of switches 1, but the openings 3a and 3b associated with each switch are readily covered by the first arm 1a of each switch 1, in its nondeflecting condition, so as to avoid interruption of the movement of the documents across the transfer table 3. Similarly, the gap 6 between the forward edge 11a of each second opening 3b in the transfer table 3 and the flexed second arm 1b of each switch 1 may be quickly and reliably opened by putting the switch 1 into its deflecting condition.

In an alternative construction of the sorting apparatus, the switch 1 may be put into its deflecting condition by the operation of an electromagnet disposed in the region of the upwardly bent portion 8a of the guide

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plate 8, instead of using the electromagnet having the movable core 5.

Having described my invention, I claim:

1. A document-sorting apparatus comprising:

guide means defining a path for documents to be sorted traveling along said path with a leading edge in a forwardly direction;

deflecting means for intercepting documents displaced along said path and deflecting same out of said path, said deflecting means comprising a first flat flexible and resilient arm and a second flat flexible and resilient arm including with said first arm an acute angle with the vertex turned in the direction opposite the direction of travel of said documents;

drive means engaging one of said arms for swinging said vertex transversely to said path whereby an arm of said deflecting means intercepts said path to guide an oncoming document, engaging the latter arm with its leading edge, downwardly along this latter arm, one of said arms being fixed at its end remote from said vertex;

a document-receiving platform spaced below said path and said latter arm and parallel to said path to define with said path a free-fall space traversed by a downwardly deflected document for receiving the downwardly deflected documents in succession;

an upstanding abutment disposed at said platform for engagement with the leading edges of the deflected documents as they deposit on said platform;

a roller juxtaposed with an upper surface of said platform adjacent said abutment and engageable with the documents deposited thereon for advancing same into engagement with said abutment, both of said arms being formed from strip-spring material, said drive means including an electromagnet for displacing the nonfixed arm, said roller being mounted for vertical displacement upon accumulation of documents in a stack on said platform; and means for vertically displacing said platform downwardly with growth of said stack in response to the position of said roller, said platform being provided with a vertical supporting column, a lock member preventing downward displacement of said column in one position and permitting such displacement in another position, electromagnet means cooperating with said member for shifting same between said positions, an arm supporting said roller, and switch means operable by the arm supporting said roller for controlling said electromagnet means.

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