

This invention relates to a device for cutting stacked sheet material, with a table for receiving the material to be cut, a forward feed device for the material to be cut, a cutting knife which can travel perpendicular to the plane of the table, a crosshead of a press disposed adjacent to the cutting knife and which can be lowered on to the material to be cut, and with a plate-shaped front pusher which can be brought into contact with the front face of the material to be cut for aligning the material on the forward feed unit.

In order to ensure accurate separation of a stack of material to be cut in the region of the predetermined cutting line, it is absolutely necessary that the stack is present accurately aligned. This is ensured, for example, by the placement of the stack on the forward feed device and by a lateral stop.

After the crosshead of the press is raised following a cut the stack to be cut expands underneath the crosshead of the press. Depending on the nature of the material to be cut, this results in a more or less pronounced movement, particularly of the upper layers of sheets of the stack of sheet material, away from the forward feed device. Even when the material to be cut is advanced at a speed of forward feed which permits industrial manufacture, the upper layers of sheets of the stack to be cut cannot be prevented from "running away" from the forward feed device and thus losing contact with the latter when it is stopped; this effect is particularly pronounced with material to be cut which has a low specific weight and/or a smooth surface.

A device of the type cited initially is known from EP 0 056 874 A2. In this device the table is of two-piece construction, a rear table serves to receive the material to be cut and a front table serves to receive the cut material. The front table and the rear table are movable in order to form a gap between them, so that it is possible for waste material arising during edge- and intermediate cuts to be disposed of through this gap. The front pusher, which is constructed as a guide plate, and which in its inoperative position is disposed underneath the table, can be swung through the gap into a vertical position, due to which the material to be cut, which extends as far as the front edge of the rear table is pushed towards the forward

feed device, which extends over the width of the rear table. The guide plate can thus only become effective when the front and rear tables are moved apart, and even then only in a plane running through the front edge of the rear table parallel to the cutting plane of the cutting knife. Thus the solution described cannot in principle be applied to devices of the said type in which the table is of one-piece construction.

A device for cutting stacked sheet material is known from EP 0 242 763 A2, in which a front table and a rear table can likewise be separated in order to form a gap between them so that the waste material can be disposed of through the gap. As distinct from the function of the guide plate described above, this device has a guide plate which when the gap is closed is disposed under the front table in the region of the parting plane of the front and rear tables and which when the gap is opened is moved into an operating position in which it is seated against the rear edge of the front table over the entire length of the parting plane and is vertical to the plane of the table. The guide plate serves the purpose of pushing the cut product which was the last to be cut and which projects beyond the rear edge of the front table completely on to the front table, and during the subsequent intermediate cut it at the same time prevents the material to be cut, particularly brittle material, from being thrown on to the front table. Finally, it performs the function of an alignment face for the cut product which was the last to be cut and which is shifted within itself due to the geometry of the cutting wedge of the cutting knife. Alignment is effected by means of a front pusher which is swivel-mounted in the front table and which aligns the cut product on the guide plate by an appropriate swivelling movement. It is necessary to position the front pusher differently according to the extent of each cut product in the direction of forward feed.

The object of the present invention is to further fashion a device of the said type so that it is also possible to align the material to be cut on the forward feed device without removing or moving the cut product.

This object is achieved in that the front pusher can be moved at a slant from above the table towards the front face of the material to be cut and in its lower end position is positioned with its abutting face substantially in the cutting plane of the cutting knife. On account of the movement of the front pusher at a slant from above the table, with a component of

motion opposite to the direction of forward feed of the material, the possibility exists of introducing it into the wedge formed, corresponding to the wedge shape of the cutting knife, between the material to be cut and the cut product which was the last to be cut. The cut product which was the last to be cut does not have to be removed here in order to be able to align the material to be cut on the forward feed device. Another advantage of the solution according to the invention is that the front pusher takes up a substantially constant lower end position, namely one in which it is positioned with its abutting face substantially in the cutting plane of the cutting knife. The term "substantially" may be paraphrased as meaning that the upper region of the front pusher can also be slightly slanted in the direction of the material to be cut, so that in its lower end position it presses the upper layers of sheets more strongly on to the forward feed device than the lower layers and thus takes into account the situation that the upper layers "run away" more pronouncedly from the forward feed unit than do the lower layers. As a general rule it is sufficient if the upper region of the front pusher is positioned at a maximum of 5° from the cutting plane of the cutting knife; even 2 to 3° is usually sufficient. The front pusher is advantageously mounted for this purpose so that it is angularly adjustable.

According to a particular embodiment of the invention, the front pusher can only be placed on the stack to be cut in the upper region of the latter, particularly on the top half of the stack. The invention is not restricted to a one-piece construction of the table, but can also be used with the two-piece construction of the table described above. The length of the front pusher should advantageously approximately correspond to the length of the cutting knife, in order thus to ensure the alignment of the material to be cut over the entire width of a stack which has the maximum dimension determined by the device.

According to a particular embodiment of the invention, the front pusher is mounted in a frame of the device associated with the cutting knife and the crosshead of the press, on the side of the frame facing the material to be cut. Bearing flanges are advantageously attached to the frame at a distance from each other and each have a bearing bush for a displaceable, power-operated guide rod, wherein the guide rods receive the front pusher, which is positioned parallel to the cutting plane of the cutting knife, at their lower ends. Two guide rods are advantageously provided, the movement of which is coupled via a synchronising

guide. In addition, an adjusting cylinder, the piston rod of which acts on a projection attached to the upper end of the associated guide rod, should be connected to each bearing flange, wherein an adjustable stop projects into the downwardly oriented path of movement of the projection. By this means the lower end position of the front pusher can be unambiguously predetermined. Because stacks of different heights have to be cut in the course of cutting operations, a further development of the invention provides for the bearing flanges to be disposed in the frame so that they are height-adjustable, so that the end position of the front pusher is also height-adjustable.

The front pusher, which is advantageously oriented parallel to the cutting plane over its entire range of adjustment, may in principle be manufactured from any desired materials. However, it is considered to be advantageous if the front pusher is of resilient construction in the region of its abutting face. In addition, it may be provided with air nozzles in the region of its abutting face. These air nozzles are advisedly operated until the front pusher comes into contact with the stack to be cut, and simplify the process of alignment due to the fact that they introduce air between at least the upper layers of sheets of the stack of material to be cut.

Other features of the invention are illustrated in the description of the Figures and in the subsidiary claims, wherein it should be remarked that all individual features and all combinations of individual features are essential to the invention.

The invention is illustrated in the Figures by way of an example of an embodiment, without being restricted thereto.

The illustrations are as follows:

Figure 1 is a schematic illustration of the device according to the invention as a side view with the front pusher situated in its upper end position;

Figure 2 is an illustration corresponding to that of Figure 1, with the front pusher situated in its lower end position; and

Figure 3 is a view X, as indicated in Figure 1, of part of the mechanism for operating the front pusher.

Figures 1 and 2 are highly simplified illustrations of a guillotine type cutting machine for cutting paper, cardboard or the like, with the essential elements of the invention for aligning the material to be cut 1 on a forward feed unit 2. In the known manner, the guillotine type cutting machine comprises a table 3 with a cutting strip 4 inset in the latter and extending over the entire width of the table 3. The forward feed unit 2 with the forward feed bracket 2a likewise extends over the entire width of the table 3. The forward feed unit can travel in the direction of arrow A, which indicates the basic direction of movement of the material to be cut during the course of cutting. The cut material 5 is indicated in the form of three cut products 5a, 5b and 5c, which have shifted within themselves, behind the cutting strip 4 as seen in the direction of forward feed A. A cutting knife 7 is disposed above the cutting strip 4. The cutting knife is shown in the Figure in its raised position, from which it can be lowered in the direction of arrow B until it contacts the cutting strip 4. A crosshead 8 of a press is provided adjacent to the cutting knife 7, and can also be lowered on to the material to be cut 1 from the raised position shown in Figure 1. The cutting knife 7 and the crosshead 8 of the press are guided in a frame 9 of the guillotine type cutting machine which surrounds them at the top and at the sides. The cutting plane of the cutting knife 7, which extends perpendicular to the plane of the table and through the cutting strip 4, is denoted by reference numeral 10.

In order to cut a product 5a the material to be cut is advanced by means of the forward feed unit 2 until the desired thickness of the material to be cut projects beyond the cutting plane 10. The crosshead 8 of the press is then lowered on to the material to be cut, the individual layers of sheets being compressed under the crosshead 8 of the press. The cutting knife 7 is then lowered, and when the cut is made the cut product 5a is separated from the remaining stack of material to be cut 1, the cut product 5a being shifted within itself in the form of a parallelogram as a result of the shape of the lower region of the cutting knife 7 which is in the form of a wedge 7a. After the cutting knife 7 is moved back into its upper, inoperative position the crosshead 8 of the press is also moved back into its upper, inoperative position, whereupon due to the expansion of the material to be cut 1 this stack of material to be cut

moves away slightly from the forward feed bracket 2a, particularly in the region of the upper layers of sheets 6, and is thus no longer accurately seated there.. This situation is clearly illustrated in Figure 1, which, however, shows three cut products 5a, 5b and 5c which have already been cut.

According to the invention, a device 11 is now provided for aligning the stack of material to be cut 1, which has shifted slightly within itself after the crosshead 8 of the press has been raised, on the forward feed unit 2. This comprises, as an essential component, a movable front pusher 12 which is disposed underneath the cutting knife 7 and which extends over the entire length of the cutting knife 7. The front pusher is constructed as a vertically oriented plate which can be moved at a slant from above the table 3 towards the front face of the material to be cut 1 with a horizontal component of motion opposite to the direction of forward feed A of the material. The lower end position of the front pusher 12 is selected so that its abutting face 14 coincides with the cutting plane 10 when the front pusher 12 is lowered into its lower end position. When it is lowered into its lower end position the front pusher 12 thereby aligns the stack of material to be cut 1, which has shifted slightly within itself, on the forward feed bracket 2a of the forward feed unit 2. This is shown in the illustration of Figure 2. The front pusher 12 can be moved back into its upper end position again in the direction of arrow C from the position of the front pusher 12 which is indicated.

In detail - see the illustration of Figure 3 in this respect also - two bearing flanges 15 are attached to the horizontal section of the frame 9 at a distance from each other and each have a bearing bush 16 for a guide rod 17 which is displaceable in their longitudinal direction. At their lower ends the guide rods receive the front pusher 12, which is positioned parallel to the cutting plane 10 of the cutting knife 7 and which is shown only in the illustrations of Figures 1 and 2. In addition, a pneumatically acting adjusting cylinder 18 is connected to each bearing flange 15, the piston rod 18a of which adjusting cylinder acts on a plate-shaped projection 19 attached to the upper end of the associated guide rod 17. A stop 20, which can be screwed into the bearing flange 25 [sic] and which is thereby adjustable, projects into the downwardly oriented path of movement of the respective projection 19 and defines the lower end position of the front pusher 20 [sic]. Finally, a synchronising shaft 21 is rotatably mounted in the two bearing flanges 15, the two ends of which shaft are each provided with

a gearwheel 22 which meshes with the toothed rack sections 23 of the guide rods 17. The bearing flanges 15, and thus the front pusher 12, can be positioned vertically via vertical guides 24 attached to the frame 9.

It can be seen from the illustrations of Figures 1 and 2 that the guide rods 17 for the front pusher 12 are inclined to the vertical at an angle of about 40° , which determines the direction of adjustment of the front pusher 12. Due to this slanting direction of movement from above, after a cut has been made the front pusher can be moved from above the cut material 5 into the V-shaped gap formed between the cut product 5a which was the last to be cut and the stack of material to be cut 1, without the cut product previously having to be removed. As shown in Figures 1 and 2, it is sufficient if the front pusher 12 is only placed on the stack to be cut 1 in the region of the top half of the latter, since displacements of the individual layers of sheets 6, which have an adverse effect on the result of the cut, only occur in the region of the upper layers of sheets. In this respect the invention is not restricted to the introduction of the front pusher 2 [sic] into the gap at the angle shown, nor is it restricted to a table of one-piece construction. The invention can definitely also be applied to a two-piece table, which, by moving the part of the table associated with the cut material, enables the cut material 5 to be moved from the material to be cut 1 from the outset, and thus enables the space between the cut material 5 and the material to be cut 1 to be increased.

List of reference numerals

- 1 material to be cut
- 2 forward feed unit
- 2a forward feed bracket
- 3 table
- 4 cutting strip
- 5a cut product
- 5b cut product
- 6 sheet
- 7 cutting knife
- 7a wedge
- 8 crosshead of the press
- 9 frame
- 10 cutting plane
- 11 device
- 12 front pusher
- 13 front face
- 14 abutting face
- 15 bearing flange
- 16 bearing bush
- 17 guide rod
- 18 adjusting cylinder
- 18a piston rod
- 19 projection
- 20 stop
- 21 synchronising shaft
- 22 gearwheel
- 23 toothed rack section
- 24 vertical guide

CLAIMS

1. A device for cutting stacked sheet material, with a table for receiving the material to be cut, a forward feed device for the material to be cut, a cutting knife which can travel perpendicular to the plane of the table, a crosshead of a press disposed adjacent to the cutting knife and which can be lowered on to the material to be cut, and with a plate-shaped front pusher which can be brought into contact with the front face of the material to be cut for aligning the material on the forward feed unit, characterised in that the front pusher (12) can be moved at a slant from above the table (3) towards the front face (13) of the material to be cut (1) and in its lower end position is positioned with its abutting face (14) substantially in the cutting plane (10) of the cutting knife (7).
2. A device according to claim 1, characterised in that the front pusher (12) can only be placed on the stack (1) to be cut in the upper region of the latter, particularly on the top half of the stack (1).
3. A device according to claim 1 or 2, characterised in that the table is of one-piece construction.
4. A device according to claim 1 or 2, characterised in that the table (3) is of two-piece construction, with a rear table for receiving the material to be cut and a front table for receiving the cut material, wherein the front table and the rear table can be separated in order to form a gap between them.
5. A device according to any one of claims 1 to 4, characterised in that the front pusher (12) is mounted in a frame (9) of the device associated with the cutting knife (7) and the crosshead (8) of the press, on the side of the frame (9) facing the material to be cut (1).



6. A device according to claim 5, characterised in that bearing flanges (15) are attached to the frame (9) at a distance from each other and each have a bearing bush (16) for a displaceable, power-operated guide rod (17), wherein the guide rods (17) receive the front pusher (12), which is positioned parallel to the cutting plane (10) of the cutting knife (7), at their lower ends.
7. A device according to claim 6, characterised in that two guide rods (17) are provided, the movement of which is coupled via a synchronising guide (21, 22, 23).
8. A device according to claim 6 or 7, characterised in that an adjusting cylinder (18), the piston rod (18a) of which acts on a projection (19) attached to the upper end of the associated guide rod (17), is connected to each bearing flange (15), wherein an adjustable stop (20) projects into the downwardly oriented path of movement of the projection (19).
9. A device according to any one of claims 6 to 8, characterised in that the bearing flanges (15) are disposed in the frame (9) so that they are height-adjustable.
10. A device according to any one of claims 1 to 9, characterised in that the length of the front pusher (12) approximately corresponds to the length of the cutting knife (7).
11. A device according to any one of claims 1 to 10, characterised in that the upper region of the front pusher (12) is positioned slightly out of the cutting plane (10) of the cutting knife (7) in the direction of the material to be cut (1).
12. A device according to any one of claims 1 to 11, characterised in that the front pusher (12) is of resilient construction in the region of its abutting face (14).
13. A device according to any one of claims 1 to 12, characterised in that the front pusher (12) is provided with air nozzles in the region of its abutting face (14).

