

This invention relates to a device for cutting stacked sheet material, with a table area which has a field of action above which a cutting knife and a crosshead of a press are located, with an input field behind it for receiving the material to be cut and an output field in front of it for receiving the cut material, and with a forward feed device for the material to be cut, wherein the output field is movable in relation to the field of action with the formation of a gap and a transverse channel leading to a further processing station and having an ejector which can move along the transverse channel is provided on the output field, wherein in addition the transverse channel is formed between a first guide plate, which can tilt about a horizontal axis in order to support the stack of cut material during cutting and subsequently to set it upright again, and a second guide plate which is situated behind the first guide plate and which can be brought into its operating position after the gap has opened, and a holding-down device is provided which can be placed on the cut material.

A device of this type for cutting stacked sheet material is known from DE 36 13 316 C1. In this device the two guide plates serve the purpose, amongst others, of forming the transverse channel through which the cut material, i.e. block strips or blocks, situated between the guide plates can be pushed out by means of the ejector for further processing. In order to support the fed material securely immediately before the cut is made, which is necessary due to the geometry of the cutting knife and to the parallelogram shape of the material which is thus present after the cut is made, provision is made there for the first guide plate to be capable of tilting about a lower horizontal axis in order thus to support the stack of cut material when the cut is made and subsequently to align it vertically again against the second guide plate, which has moved into its operating position after the formation of the gap. When the material is cut, a holding-down device is placed on top of it. This improves the holding of the material and also ensures that the sheet material does not break away above the guide plate, particularly if the material is somewhat brittle.

Although this known device has been proven in practice, it leads to problems when its use involves the reliable manipulation of relatively high stacks of small labels, revenue seals or the like, which are narrow in the direction of advance. The maximum extent of the stack

here in the direction of advance is about 25 mm. At thicknesses which are just less than 25 mm, the stack tends to tilt when the gap opens, and thus before the first guide plate can be brought into its operating position, due to the angle formed after cutting between its support area and the contact area of the first guide plate, which is significantly greater than 90° .

The object of the present invention is to further fashion a device of the aforementioned type so that cut stacks of reduced thickness can also be simply and reliably processed using it.

This object is achieved in that the first guide plate has a support area and a contact area, disposed at a right angle to the support area, for the cut material, wherein when the guide plate is in its upright position the support area substantially forms a plane with the field of action and has an extent in the direction of advance of the material which is less than the extent of the cut material in the direction of advance.

When the gap is closed, the material to be cut is advanced beyond the cutting plane by the desired cut section thickness with the support area of the first guide plate disposed horizontally, so that the region of the cut section projecting beyond the cutting plane rests completely on the support area of the first guide plate forming the output field. Because the support area substantially forms a plane with the field of action, i.e. is positioned coincident with or slightly lower than the latter so that a step is formed from the field of action to the support area, it is ensured that the material to be cut can be pushed over without butt contact with the support area of the first guide plate. In this respect, the lesser extent of the field of action in the direction of advance compared with the extent of the cut material in the direction of advance is obtained due to the cutting strip which is associated with the field of action and which is set back in relation to the separating plane of the field of action and output field. The first guide plate is shortened in the region of its support area in relation to the material awaiting its cut, corresponding to this displacement. When the cutting knife moves down, its wedge shape displaces the material to be cut in the form of a parallelogram, and the first guide plate is tilted in accordance with the deflection movement of the material. The right-angled arrangement of the support area and contact area of the first guide plate ensures that at any time during the cutting of the block and the tilting movement of the first guide plate the cut section is securely held in the tilted position by the first guide plate.

When the first guide plate is tilted the gap is formed between it and the field of action. The second guide plate is then advanced into its operating position, and the first guide plate is finally tilted back again so that its support area is in a horizontal position and its contact area is in a vertical position, the respective cut section being guided in a defined manner between the two guide plates in this position. Before the cut section is ejected the first guide plate is moved away from the cut section slightly in the direction of advance of the material to be cut, so that any jamming of the cut section is released and the cut section can then be fed to the further processing station by means of the ejector.

The first guide plate can preferably be tilted away from the cutting plane so that its contact area is tilted by an angle of about 30° from the vertical. The support area of the first guide plate preferably has an extent of 10 to 20 mm, most preferably 15 to 20 mm, in the direction of advance of the material to be cut, and the cut material preferably has an extent of 15 to 25 mm, most preferably 20 to 25 mm, in the direction of advance.

According to one particular embodiment of the invention, provision is made for the first guide plate to have two limbs disposed in the shape of an L, which comprise the support area and the contact area.

In order to effect the tilting movement of the first guide plate a bearing plate is preferably provided, which is oriented substantially vertically and which can be moved horizontally and tilted, and the limb of the first guide plate comprising the contact area is mounted on the bearing plate so that it is movable in the plane of the bearing plate and can travel substantially in a vertical direction. First pneumatic cylinders advantageously pivotally engage on the limb of the first guide plate comprising the contact area with the free ends of their piston rods at a distance from the line of intersection of the limbs, in addition second pneumatic cylinders pivotally engage on the limb of the first guide plate comprising the contact area with the free ends of their piston rods at a greater distance from the line of intersection of the limbs, and third pneumatic cylinders, which act substantially in the transverse direction of the bearing plate and of the limb comprising the contact area, non-positively connect these limbs and the bearing plate to each other. The limb of the first guide plate comprising the contact area should be attached at its end remote from the limb

comprising the support area to a further bearing limb, which is oriented in the opposite direction to the limb comprising the support area and which receives the third pneumatic cylinders, the piston rods of which are attached to projections on the bearing plate on its side remote from the first guide plate. Acting upon the guide plate or the bearing plate by means of three means of force which act independently of each other enables a tilting movement of the first guide plate from the vertical position of the limb comprising the contact area to be accomplished which is produced by a superposition of the movement of the first and second pneumatic cylinders away from the material to be cut and of the movement of the first guide plate downwards by means of the third pneumatic cylinders. It is thus ensured that the edge facing the field of action of the limb of the first guide plate which comprises the contact area does not extend beyond the plane of the field of action when tilting occurs.

In detail, the first pneumatic cylinders should be able to travel with a component of motion in or opposite to the direction of advance of the material to be cut and the second pneumatic cylinders should be motionally coupled to the first pneumatic cylinders, wherein the movement of the piston rods of the first and second pneumatic cylinders should take place in or opposite to the direction of advance of the material to be cut.

Due to the lesser extent of the field of action in the direction of advance compared with the extent of the cut material in this direction, the second guide plate should be provided with a support strip on its side facing the output field, the upper support plane of which support strip approximately forms a plane with the support area of the first guide plate when the latter is in its horizontal position. The purpose of this form of the second guide plate is that when the second guide plate is advanced its support strip supports the cut section which projects beyond the support area of the first guide plate.

The holding-down device, which can be lowered on to the material synchronously with the knife movement via separate control means, is advantageously disposed on the side of the cutting knife remote from the crosshead of the press. The holding-down device is advantageously constructed as a spring element, particularly a leaf spring element, which has a rotatable holding-down device roller mounted parallel to the line of intersection of the limbs at its lower end remote from the knife.

To prevent the cut section from adhering to the contact area of the first guide plate, the limb of the first guide plate comprising the contact area should be provided with a plurality of through-holes of small diameter. The result of this is that there is no continuous contact area for the cut section, which could lead to the risk of the cut section adhering to the contact area.

Further details of the invention are illustrated in the description of the Figures and in the subsidiary claims. It should be mentioned that all individual features and all combinations of individual features are essentially part of the invention.

The invention is schematically illustrated in the Figures by way of example with reference to an embodiment, without being restricted thereto, and where:

- Figure 1 is a section through the device according to the invention in the region of the cutting plane and perpendicular to the latter, before a cut section is cut;
- Figure 2 is an illustration corresponding to Figure 1, after the cut section is cut;
- Figure 3 is a section through the device after the gap has been formed between the field of action and the output field, with the first guide plate still tilted and the second guide plate advanced;
- Figure 4 is an illustration corresponding to Figure 3 after the first guide plate has moved so that its contact area is in a vertical position, with the ejector lowered; and
- Figure 5 is a view of the device in the direction of the arrow A in Figure 1.

Figure 1 shows a table part 1 of the device with the associated field of action 2, into which a cutting strip, which extends parallel to the front edge 3 of the field of action, is inset in the region of the front edge of the latter adjacent to its front edge 3. A cutting knife 5, and

adjacent to and behind the cutting knife a crosshead 6 of a press, are situated above the cutting strip 4 and thus above the field of action 2. The cutting plane, which extends perpendicularly to the field of action 2, is denoted by reference numeral 7. A stack 8 of stacked sheet material rests on the table part 1, which is formed by the field of action 2 and an input field situated in region B of the device, which is not illustrated in detail. A forward feed device, which serves to feed the stack 8 in the direction of advance, i.e. perpendicularly to the cutting plane 7, is disposed behind the stack 8, and is thus likewise in region B of the device.

At a distance from the table part 1 the device has a second table part 9 in which a slide 10, which extends perpendicular to the plane of the drawing and is disposed symmetrically in relation to half the extent of the cutting strip 4, is mounted so that it is movable in the direction of advance C and opposite thereto. Movement of the slide 10 is effected by a driving means, which is not shown but which is inset in the table part 9 and acts on the bottom of the slide 10. Two feed cylinders 11 are provided, which are mounted on the slide 10. These cylinders are disposed symmetrically in relation to half the length of the cutting strip and are spaced apart by about half the length of the cutting strip. A swivelling cylinder 12 is attached to the upper face of the respective feed cylinder 11 at a distance from the latter. The cylinders 11 and 12 are pneumatic cylinders, the piston rods 13 of which are oriented horizontally in the direction of advance C. The piston rod 13 is guided with a clearance in the bearing plate 15, in the transverse direction of the latter, in order to take into account the increased distance of application of the piston rods 13, 14 when the bearing plate 15 swivels. Figure 1 shows the piston rods 13 and 14 in their extended position. A bearing plate 15 extending perpendicularly to the plane of the drawing is provided, corresponding to the length of the slide 10. This bearing plate is also disposed symmetrically in relation to half the length of the cutting strip. As illustrated in Figure 1, the bearing plate is oriented vertically and the piston rods 13, 14 act on it in pairs at a distance from each other. At a slight distance to the side of the respective piston rods 13, 14, the bearing plate 15 is provided between the piston rods 14 with two slots 16 which extend over a large part of the width of the bearing plate 15, i.e. vertically. Figure 1 also shows that the device has a first guide plate 17, which consists of a central, vertical limb 17a, a horizontal limb 17b aligned opposite to the direction of advance C and attached to the lower end of the vertical limb 17a,

and a horizontal limb 17c aligned in the direction of advance C and attached to the upper end of the vertical limb 17a. The first guide plate 17 is thus again disposed symmetrically in relation to half the length of the cutting strip, the vertical limb 17a having a vertical extent which is greater than that of the bearing plate 15. The vertical limb 17a of the first guide plate 17 is provided on its side facing the bearing plate 15 with four studs 18 in vertical alignment with the two slots 16, wherein two studs pass through each one of the slots 16 and are at a distance from each other which is less than the length of the associated slot 16, so that the vertical limb 17a of the first guide plate 17 and the bearing plate 15 can be displaced vertically in relation to each other. The ends of the respective studs 18 facing the cylinders 12 and 13 are fastened with screws 19. The distance from the vertical limb 17a and the bearing plate 15 is selected so that the parts can move in relation to each other relatively free from play. Six lifting cylinders 20 are attached to the horizontal limb 17c distributed over its length. The downwardly directed piston rods 21 of these lifting cylinders pass through openings in the horizontal limb 17c and engage in collars 22 provided on the top of the bearing plate 15.

As may also be seen from the illustration in Figure 1, when the piston rods 13 and 14 are extended the first guide plate 17, which is guided by means of the bearing plate 15 via the cylinders 11 and 12, is situated with the edge 23 of its horizontal limb 17b facing the table part 1 adjacent to the table part 1. In this respect it is sufficient for the operation of the device if a slight gap is formed between the parts. In the position of the piston rods 21 of the lifting cylinders 20 which is shown in Figure 1, in which the piston rods are extended by the maximum amount, a support area formed on a surface of the horizontal limb 17b is situated slightly below the plane of the field of action 2 of the table part 1. The vertical limb 17a of the first guide plate 17 has a vertical extent which approximately corresponds to the vertical distance from the table part 1 to the raised crosshead 6 of the press, wherein the surface of the vertical limb 17a constitutes a contact area 25.

Finally, a holding-down device 26 is disposed between the cutting knife 5 and the lifting cylinders 20. An actuating drive which is attached to an overhead frame of the machine, which is not shown but which also receives the cutting knife 5 and the crosshead 6 of the press, raises or lowers the holding-down device 26 synchronously with the movement of the

knife. The holding-down device 26 comprises a spring element 26a attached to the actuating drive 27, which spring element has a holding-down device roller 26b at its lower end remote from the knife, which roller is mounted parallel to the cutting strip 4 and extends over the length of the first guide plate 17.

The mode of operation of the device will now be described:

Starting from the configuration illustrated in Figure 1, the material to be cut 8 is advanced by means of the forward feed device, which is not shown, until it comes into contact with the vertical limb 17a of the first guide plate 17. The material 8 thus projects beyond the cutting plane 7 by a length which is to be cut off, and a cut section 8' is to be formed after the cut. In this respect a single cut section 8' can be formed which extends over the entire width of the stack 8, but the primary situation considered is one in which a multiplicity of stacks 8 are already present, which are disposed side by side and oriented in the direction of advance C, so that after the cut individual blocks disposed one behind another as viewed perpendicular to the plane of the drawing are produced as the cut sections 8'.

When the cutting knife 5 moves downwards, the holding-down device roller 26b, which is moved downwards synchronously with the cutting knife 5, is placed on the partial stack or the blocks 8' immediately the knife point comes into contact with the stack 8, and presses the blocks against the first guide plate 17 as the cutting operation progresses. Synchronously with the severing of the stack 8 and thus with the formation of the cut section 8', the first guide plate 17 tilts in the direction of the arrow D about a horizontal axis which is parallel to the cutting strip 4 and which approximately coincides with the front edge 3 of the table part 1. The tilting movement comprises the superposition of three movements, namely the retraction movement of the piston rods 13 of the feed cylinders 11, the retraction movement of the piston rods 14 of the swivelling cylinders 12, and the retraction movement of the piston rods 21 of the lifting cylinders 20. The movement of the feed cylinders 11 essentially results in a backward movement of the first guide plate 17, the movement of the swivelling cylinders 12 results in the swivelling of this guide plate, and the movement of the lifting cylinders 20 results in the first guide plate 17 being moved downwards in relation to the bearing plate 15, which is fixed in relation to the piston rods 13 and 14. The tilted final

position of the guide plate 17 is shown in the illustration of Figure 2. It can be seen from this that the cut section or sections 8' contact the support area 24 and the contact area 25 of the first guide plate 17 and the holding-down device roller 26b is supported on the cut section. The Figure clearly shows that the contact area 25 of the first guide plate 17 is tilted away from the cutting plane 7 by an angle of about 30° from the vertical. The facility of guiding the slide 10 in the table part 9 serves the purpose of being able to adjust to different cut section thicknesses; however it is then of course also necessary to reset the device with regard to the extent of the horizontal limb 17b of the first guide plate 17. The table part 9 can also move in the direction of advance C and opposite thereto, and after cutting the cut section and raising the holding-down device 26 is moved in the direction of advance as shown in Figure 3, so that an enlarged gap 28 is formed compared with the situation shown in Figures 1 and 2. A second guide plate, which has hitherto been disposed below the table part 9 and which extends over the entire length of the first guide plate 17, is then moved vertically upwards, the distance from the second guide plate 29 to the tilted first guide plate 17 being designed so that when the first guide plate 17 is moved back into the position in which the limb 17a is oriented vertically again, the face of the cut section 8' remote from the contact area 25 comes into contact with the second guide plate 29. The movement of the guide plate into the aforementioned upright position of the vertical limb 17a is effected by extending the piston rods 13, 14 and 21 of the cylinders 11, 12 and 20, so that the horizontal limb 17b of the first guide plate 17 is again situated on the same level as that illustrated in Figure 1. Figure 4 clearly shows the situation described, and also shows that the second guide plate 29 is provided on its side facing the first guide plate 17 at the height of the horizontal limb 17b with a support strip 30 extending perpendicular to the plane of the drawing over the entire length of the guide plate 29, the upper support plane 31 of which support strip approximately forms a plane with the support area 24 of the first guide plate 17. In the transverse channel 32 which is thus created between the two guide plates 17 and 29 an ejector 33 is lowered behind the cut section 8' on to the support area 24 of the first guide plate 17. The first guide plate 17 is then moved away slightly from the second guide plate 29 by a corresponding retraction movement of the piston rods 13 and 14 of the cylinders 11 and 12, so that the cut section 8' can be pushed out in the longitudinal direction of the transverse channel by means of the ejector 33 to a further processing station, which is not illustrated, without becoming jammed between the two guide plates 17 and 29.

Movement of the first guide plate 17 into the position shown in Figure 1 is effected after raising the ejector 33 and lowering the second guide plate 29, and after moving the table part 9 back towards the table part 1 and the renewed complete extension of the piston rods 13 and 14 of the cylinders 11 and 12.

Amongst other features, Figure 5 illustrates that the vertical limb 17a of the first guide plate 17 which comprises the contact area 25 is provided with a plurality of through-holes 24 of small diameter.

In the device described the support area 24 of the first guide plate 17 forms the output field of the table area. However, the possibility definitely exists of the surface 35 of the table part 9 also functioning as the output field, namely when the first guide plate 17 is moved by means of the slide 10 in the direction of advance out of the region of the table part 9 facing the table part 1 and the gap 28 between the two table parts 1 and 9 is completely closed, so that the table area constitutes a continuous area comprising the field of action 2 and the surface 35, i.e. the output field. In a manner of use such as this, cuttings formed during edge cuts or intermediate cuts can be disposed of downwards through the gap 28 by opening the latter previously.

List of Reference Numerals

1	Table part
2	Field of action
3	Front edge
4	Cutting strip
5	Cutting knife
6	Crosshead of press
7	Cutting plane
8	Stack
8'	Cut section
9	Table part
10	Slide
11	Feed cylinder
12	Swivelling cylinder
13	Piston rod
14	Piston rod
15	Bearing plate
16	Slot
17	First guide plate
17a	Vertical limb
17b	Horizontal limb
17c	Horizontal limb
18	Stud
19	Screw
20	Lifting cylinder
21	Piston rod
22	Collar
23	Edge
24	Support area
25	Contact area
26	Holding-down device

26a	Spring element
26b	Holding-down device roller
27	Actuating drive
28	Gap
29	Second guide plate
30	Support strip
31	Support plane
32	Transverse channel
33	Ejector
34	Through-hole
35	Surface

CLAIMS

1. A device for cutting stacked sheet material (8), with a table area which has a field of action (2) above which a cutting knife (5) and a crosshead (6) of a press are located, with an input field (24) behind it for receiving the material to be cut (8) and an output field in front of it for receiving the cut material (8'), and with a forward feed device for the material to be cut, wherein the output field (24) is movable in relation to the field of action (2) with the formation of a gap (28) and a transverse channel (32) leading to a further processing station and having an ejector (33) which can move along the transverse channel (32) is provided on the output field (24), wherein in addition the transverse channel (32) is formed between a first guide plate (17), which can tilt about a horizontal axis in order to support the stack of cut material (8') during cutting and subsequently to set it upright, and a second guide plate (29) which is situated behind the first guide plate (17) and which can be brought into its operating position after the gap (28) has opened, and a holding-down device (26b) is provided which can be placed on the cut material (8'), characterised in that the first guide plate (17) has a support area (24) and a contact area (25), disposed at a right angle to the support area, for the cut material (8'), wherein when the guide plate (17) is in its upright position the support area (24) substantially forms a plane with the field of action (2) and has an extent in the direction of advance (C) of the material (8, 8') which is less than the extent of the cut material (8') in the direction of advance (C).
2. A device according to claim 1, characterised in that the first guide plate (17) can be tilted away from the cutting plane (7) so that its contact area (25) is tilted by an angle of about 30° from the vertical.
3. A device according to claim 1 or 2, characterised in that the support area (24) preferably has an extent of 10 to 20 mm, most preferably 15 to 20 mm, in the direction of advance (C) of the material to be cut (8), and the cut material (8')



preferably has an extent of 15 to 25 mm, most preferably 20 to 25 mm, in the direction of advance (C).

4. A device according to any one of claims 1 to 3, characterised in that the first guide plate (17) has two limbs (17a, 17b) disposed in the shape of an L, which in turn comprise the contact area (25) and the support area (24).
5. A device according to any one of claims 2 to 4, characterised in that a bearing plate (15) is provided, which is oriented substantially vertically and which can be moved horizontally and tilted, and the limb (17a) of the first guide plate (17) comprising the contact area (25) is mounted on the bearing plate (15) so that it is movable in the plane of the bearing plate (15) and can travel substantially in a vertical direction.
6. A device according to claim 5, characterised in that first pneumatic cylinders (11) pivotally engage on the limb (17a) of the first guide plate (17) comprising the contact area (25) with the free ends of their piston rods at a distance from the line of intersection of the limbs (17a, 17b), second pneumatic cylinders (12) pivotally engage on the limb (17a) of the first guide plate (17) comprising the contact area (25) with the free ends of their piston rods (14) at a greater distance from the line of intersection of the limbs (17a, 17b), and third pneumatic cylinders (20), which act substantially in the transverse direction of the bearing plate (15) and of the limb (17a) comprising the contact area (25), non-positively connect the said limb (17a) and the bearing plate (15) to each other.
7. A device according to claim 6, characterised in that the limb (17a) of the first guide plate (17) comprising the contact area (25) is attached at its end remote from the limb (17b) comprising the support area (24) to a further bearing limb (17c), which is oriented in the opposite direction to the limb (17b) comprising the support area (24) and which receives the third pneumatic cylinders (20), the piston rods (21) of which are attached to projections on the bearing plate (15) on its side remote from the first guide plate (17).



8. A device according to claim 7, characterised in that the tilting movement of the first guide plate (17) from the vertical position of the limb (17a) comprising the contact area (25) is produced by a superposition of the movement of the first and second pneumatic cylinders (11, 12) away from the material to be cut (8) and of the movement of the first guide plate (17) downwards by means of the third pneumatic cylinders (20).
9. A device according to any one of claims 3 to 8, characterised in that the first pneumatic cylinders (11) can travel with a component of motion in or opposite to the direction of advance (C) of the material to be cut (8) and the second pneumatic cylinders (12) are motionally coupled to the first pneumatic cylinders (11), wherein the movement of the piston rods (13, 14) of the first and second pneumatic cylinders (11, 12) takes place in or opposite to the direction of advance (C) of the material to be cut (8).
10. A device according to any one of claims 1 to 9, characterised in that the second guide plate (29) is provided with a support strip (30) on its side facing the output field (24; 35), the upper support plane (31) of which support strip approximately forms a plane with the support area (24) of the first guide plate (17) when the latter is in its horizontal position.
11. A device according to any one of claims 1 to 10, characterised in that the holding-down device (26), which can be lowered on to the material to be cut (8') synchronously with the knife movement via separate control means (27), is disposed on the side of the cutting knife (5) remote from the crosshead (6) of the press.
12. A device according to claim 11, characterised in that the holding-down device (26) comprises a spring element (26a) which has a rotatable holding-down device roller (26b) mounted parallel to the line of intersection of the limbs at its lower end remote from the knife.



13. A device according to any one of claims 4 to 12, characterised in that the limb (17b) of the first guide plate (17) comprising the contact area (25) is provided with a plurality of through-holes (34) of small diameter.

