

MACHINE FOR CUTTING FLAT STOCK

The present invention concerns a machine for cutting flat stock, especially sheets of material. It has a counter that accommodates the stock and a cutting assembly. The cutting assembly comprises a knife mounted on a beam that travels up and down toward and away from the counter in a machinery frame. The beam accommodates at least two separated and knife-positioning components that support the back of the knife against the beam.

A wide range of flat-stock cutting machines are known, from European Patent 0 056 874 for example.

Machines of the genus initially described herein are known in practice. The knife is secured to the beam by several screws. The screws screw into threaded bores in the knife and through slots in the beam that extend vertically in relation to the surface of the counter. The knife can accordingly be adjusted on the beam in order to compensate for wear and sharpening. The knife in flat-stock cutting machines wherein the knife can be adjusted in relation to the beam is usually attached to the beam at at least two points in addition to the aforementioned screws. This is usually done either with setscrews that can be screwed in and out parallel to the knife's stroke or with cams that apply force to the back of

the knife. There is a drawback in that setscrews and cams tend to dig into the soft back of the knife, which accordingly changes position in relation to the beam. The knife can accordingly be damaged during continuous operation when the back slips out for example, and precise cutting will no longer be possible.

The object of the present invention is a simple improvement in a machine of the aforesaid genus ensuring that the knife will reliably maintain its position on the beam for a long time.

This object is attained in accordance with the present invention in a machine of the aforesaid genus in that each knife-positioning component rests against a pressure-accommodating component on the back of the knife whereby at least that area of the pressure-accommodating component that comes into contact with the knife-positioning component is hard. Since the hard pressure-accommodating component is a separate component, it will be unnecessary to harden the metal knife as a whole in order to prevent the knife-positioning component from digging into its back. All that is necessary is to satisfactorily harden the contact between the knife-positioning component and the pressure-accommodating component. No such property is necessary between the

pressure-accommodating component and the back of the knife, where the pressure is very slight.

The knife-positioning components can be cams or setscrews. They can be of hardened metal. The area of the pressure-accommodating component that comes into contact with the knife-positioning component can also be hard, made of hardened metal for example. The components can basically be of any appropriate materials that are hard enough to withstand considerable pressure. The hardness of the pressure-accommodating component allows the knife to be in two parts, a holder of soft metal and a blade that does the actual cutting. The blade is accommodated in a recess in the holder and hard-soldered to it. The material is accordingly hardened only where necessary to accommodate powerful force or pressure. In other areas less expensive unhardened materials can be employed.

The knife-positioning component in one preferred embodiment of the present invention includes a cam mounted in a practical way on a perpendicular blade-positioning component supporting shaft and accommodated in the knife. The cam can accordingly be rotated relative to the knife beam, varying the position of the knife to the knife beam over a wide range. The circumference of the cam can include a section

extending half way around a circle that can be brought into contact with the back of the knife. The axis of the shaft can be positioned off the center of the circle, resulting in an eccentricity that allows maximal displacement as the cam rotates approximately 180 °. The cam can of course also rotate farther, up to 300 ° for example, if it is helical instead of circular. It will basically be sufficient for the cam to rotate relative to the shaft and be stabilized against the back of the knife by the beam. It is, however, of advantage for the cam to be mounted tight on the blade-positioning component supporting shaft. The shaft can in this event be prevented from rotating backward and can be secured axially by a clamp. The cam can alternatively be secured by friction-generating material between it and the beam. The friction-generating material can be in addition to the clamp.

To particularly facilitate operation of the machine, the blade-positioning component supporting shaft should extend through a bore in the knife holder and accordingly be accessible for rotation and positioning by the operator.

It is particularly significant that the pressure-accommodating component is not part of the overall machinery but inserted between the back of the knife and the knife-positioning component. The pressure-accommodating component

will accordingly always rest optimally against the back of the knife even when it is distorted or not precisely positioned for other reasons. The pressure-accommodating component in one particular embodiment of the present invention is attached to a flat guide positioned between the cam and the beam and extending behind the blade-positioning component supporting shaft. The guide is accordingly secured between the cam and the beam, and its extension behind the shaft ensures that it will be suspended from the shaft when the knife is removed. It will be practical for the blade-positioning component supporting shaft to extend through a slot in the guide. The guide will accordingly be positioned between the cam and the beam in this embodiment and cannot get lost, although it can be displaced along the slot as the cam rotates.

One particular advanced version of the present invention includes a spacer between the pressure-accommodating component and the knife. The spacer is employed when the knife is worn down too far for its back to be far enough away from the beam even when the knife-positioning components have been maximally adjusted. The knife can in this event still be adjusted, depending on the thickness of the spacer. It will be practical for the spacer to be attached to and particularly screwed to the knife.

It will be of advantage for the pressure-accommodating components and spacers to be accommodated only where pressure needs to be distributed. It will also be of advantage for the pressure-accommodating components and spacers or both to be parallelepipedal.

To ensure that the knife is secured to the beam in accordance with the differences in their positions, the beam can have several slots paralleling the displacement of the knife relative to the knife holder, at least one threaded bore in the knife can be associated with each slot, and a setscrew can extend through the bore and the slot. In the event that a spacer is employed to extend the possible displacement of the knife relative to the beam, the knife should have several bores associated with and distributed along each slot. The slots can accordingly be relatively short and the displacement extended by screwing each screw into the bore associated with the particular slot.

Further characteristics of the present invention will be evident from the following specification and from the figures. All characteristics and combinations thereof are essential to the present invention.

The figures illustrate two embodiments of a machine for

cutting flat stock in accordance with the present invention without limiting its scope in any way.

Figure 1 is a front view of the machine.

Figure 2 is a detail of the area A in Figure 1, illustrating one version of how the knife can be suspended.

Figure 3 is a section along the line B B in Figure 2.

Figure 4 illustrates how the knife illustrated in Figure 2 is suspended with a spacer.

Figure 5, finally, is a section illustrating another version of how the knife can be suspended in the embodiment illustrated in Figure 3.

The machine 1 for cutting flat stock illustrated in Figure 1 comprises a base 2 and a counter 3 along with a guillotine 4 that extends over it. The stacks of material to be cut are deposited on the surface 6 of counter 3, perpendicular to the major plane of the material, which is essentially in the form of sheets.

Figure 1 illustrates machine 1 as seen by the operator.

Accommodated behind guillotine 4 and in counter 3 is a rake-like saddle 7 with prongs 8 that advance the material perpendicular to its major plane. A beam 9 travels up and down, along the major plane of the material, that is, in guillotine 4. Behind beam 9 and with only its lower edge visible is a knife 10 with an edge 13. Knife 10 is screwed to beam 9. Unillustrated screws extend through several vertical slots 11 in beam 9 and into matching threaded bores in knife 10. Behind knife 10 and with only its lower edge visible is a hold-down 12 with a lower surface 5 for securing the material while it is being cut. The lower edges of beam 9 and knife 10 slope toward the surface 6 of counter 3 in Figure 1 because they are in the process of producing a rocking cut and accordingly come to rest paralleling surface 6 only at their lower dead point. Figure 1 represents beam 9, knife 10, and hold-down 12 lifted.

Also illustrated in Figure 1 is a data-input pad 14, a display screen 15, a switch 16, pushbuttons 17, a pedal 19 for initiating the cut, and lateral baffles 18.

As will be evident from Figure 1, machine 1 has in the vicinity of beam 9 two horizontally separated knife-positioning components 20. Two versions of such a component are illustrated in Figures 2 through 5.

Figure 2 illustrates how knife 10 is attached to beam 9 in the vicinity of two slots 11 in beam 9. Each slot 11 has a screw 21, only the threaded section of which is illustrated, extending through it from the front. Each screw screws into a matching threaded bore in knife 10. Since slots 11 are vertical in relation to the surface 6 of counter 3, it is possible to vary the distance between the lower edge 13 of the knife and surface 6 without moving beam 9. Knife suspension-and-positioning components 20 can maintain knife 10 in any desired position. A cam 22 is provided for this purpose. As will be evident from Figures 2 and 3, one section 23 of the circumference of cam 22 extends in the form of a helix around an angle of approximately 300 °. A perpendicular blade-positioning component supporting shaft 24 extends tightly through cam 22 and loosely through horizontal bore 25 in beam 9. The helix curves around the axis 26 of shaft 24. Shaft 24 is force fit to cam 22 by a square section that matches an opening in the cam.

Between cam 22 and the back 28 of knife 10 is a parallelepipedal pressure-accommodating component 29 of hard metal. Pressure-accommodating component 29 is fastened to a flat guide 31 by two screws 30. Guide 31 extends vertically with its lower end accommodating pressure-accommodating component 29. The guide has an axially parallel slot 32 in

the center. Guide 31 is positioned between cam 22 and beam 9, with shaft 24 extending through slot 32.

The materials employed in the vicinity of knife 10 will now be specified. Cam 22 and pressure-accommodating component 29 are hardened steel, allowing accommodation of the pressure deriving from the linearity of the contact between them. Due to the relatively low pressure between pressure-accommodating components 29 and the back 28 of knife 10, the knife is in two parts. It comprises in a known way a holder 33 and a blade 34. Holder 33 is of non-hardened steel and incorporates back 28. Blade 34 is of hardened steel and does the actual cutting and incorporates edge 13. The blade fits into a recess in holder 33, to which it is hard-soldered. Knife 10 can be reground in accordance with the vertical breadth of blade 34, in which case the vertical breadth of the knife itself will decrease. A machine for cutting flat stock with a blade-positioning component in accordance with the present invention allows precise positioning of even a completely ground-down knife 10 due to the separated cams 22. Figure 2 illustrates the thickness x' of a new knife 10. When knife 10 is fresh, cam 22 will be rotated about 180 ° out of the position illustrated in Figure 2, and its circumference section 23 will be in contact with pressure-accommodating component 29. When knife 10 wears down, it will be removed

from beam 9, while pressure-accommodating component 29 remains freely but securely suspended from beam 9 by way of the guide 31 in associated blade-positioning component supporting shaft 24. Once knife 10 has been sharpened, it will be attached to beam 9 by screws 21, and both cams 22 will be rotated and adjusted in relation to pressure-accommodating components 29 such that the edge 13 of knife 10 can penetrate slightly into an unillustrated cutting strip in counter 3 when beam 9 is at its lower dead point. Screws 21 are then tightened. As will be evident from Figure 2, the supporting action of cam 22 will be in effect as long as the breadth of knife 10 at least equals dimension x. To allow use of a knife 10 that has been ground down beyond that point, a parallelepipedal spacer 35 of non-hardened metal is, as illustrated in Figure 4, fastened by several screws 36 to holder 33 in the vicinity of the back 28 of knife 10. As will be evident from the figure, cam 22 will be able to execute its entire stroke again as long as there is a spacer 35 between pressure-accommodating component 29 and knife 10. Although screws 21 will be approximately at the top of slots 11 while knife 10 is fresh, they will be approximately at the middle once cams 22 have rotated all the way without the spacer and at the bottom once the cams have rotated all the way in the presence of a spacer 35.

1 Slots 11 can be shorter if more threaded bores 21 are
2 provided along them in knife 10, allowing different bores to
3 be employed depending on the breadth of knife 10. Every slot
4 32 in each guide 31 will be long enough to allow a shaft 24
5 through when the slot is off center.

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7 The cam 22 in the embodiment illustrated in Figure 5 is
8 crimped onto the rear end of blade-positioning component
9 supporting shaft 24. Shaft 24 extends through the bore 25 in
10 beam 9 and can be fastened at the front, the section remote
11 from its associated cam 22, by a clamping plate 37. Clamping
12 plate 37 has a cutout 38 in beam 9 and a bore that is
13 slightly wider than the outside diameter of shaft 24.

14 Clamping plate 37 has a threaded bore 39 paralleling the axis
15 26 of shaft 24. Bore 39 accommodates a screw 40. The shaft of
16 screw 40 extends through a bore 41 that itself extends part-
17 way through beam 9. As screw 40 screws into bore 41, clamping
18 plate 37 will tilt slightly and secure its associated shaft
19 24 both axial and rotationally. To prevent clamping plate 37
20 from getting lost while shaft 24 is not secure, the front of
21 the shaft has a safety ring 42. To allow rotation of each
22 shaft 24 and hence of its associated cam 22, the shaft has a
23 hexagonal depression 43 facing the operator that will
24 accommodate a hexagonal-headed key.



Claims

1. Machine (1) for cutting flat stock, especially sheets of material, with a counter (3) that accommodates the stock and a cutting assembly comprising a knife (10) mounted on a beam (9) that travels up and down toward and away from the counter in a machinery frame (4), whereby the beam accommodates at least two separated and knife-positioning components (20) that force the back (28) of the knife against the beam, characterized in that each knife-positioning component rests against a pressure-accommodating component (20) on the back of the knife whereby at least that area of the pressure-accommodating component that comes into contact with the knife-positioning component is hard.

2. Machine as in Claim 1, characterized in that the knife-positioning component (20) has a cam (22) or setscrew.

3. Machine as in Claim 2, characterized in that the cam (22) is mounted on a perpendicular blade-positioning component supporting shaft (24) accommodated in the knife.

4. Machine as in Claim 3, characterized in that the circumference of the cam (22) includes a section (23) extending half way around a circle or along a helix that can be brought into contact with the pressure-accommodating

component (29).



5. Machine as in Claim 3 or 4, characterized in that the cam (22) is mounted tight on the blade-positioning component supporting shaft (22).

6. Machine as in one of Claims 3 through 5, characterized in that the pressure-accommodating component (29) is attached to a flat guide (31) positioned between the cam (22) and the beam (9) and engaging the rear of the blade-positioning component supporting shaft (24).

7. Machine as in Claim 6, characterized in that the blade-positioning component supporting shaft (24) extends through a slot (32) in the guide (31).

8. Machine as in one of Claims 1 through 7, characterized in that the knife (10) includes a non-hardened metal holder (33) fastened to the beam (9) and a hardened-metal blade (34) fastened to the holder.

9. Machine as in one of Claims 2 through 8, characterized in that the cams (22) or setscrews are metal and are hardened at least where they come into contact with the force-accommodating component (29).



10. Machine as in one of Claims 1 through 9, characterized in that the force-accommodating component (29) is metal and hardened at least where it comes into contact with either blade positioning component (20).

11. Machine as in one of Claims 5 through 10, characterized in that each blade-positioning component supporting shaft (24) can be prevented from rotating or displacing axially with a clamping plate (37).

12. Machine as in Claim 11, characterized in that the blade-positioning component supporting shaft (24) extends through a bore (25) in the beam (9) and can be prevented from rotating or displacing axially from the operator's side.

13. Machine as in one of Claims 1 through 12, characterized by a spacer (35) between the pressure-accommodating component (29) and the knife (29).

14. Machine as in Claim 13, characterized in that the spacer (35) is attached to and particularly screwed to the knife (10).

15. Machine as in one of Claims 1 through 14, the pressure-accommodating component (29) and spacer (35) or both



are parallelepipedal.

16. Machine as in one of Claims 1 through 15, characterized in that the beam (9) has several slots (11) paralleling the displacement of the knife (33) relative to the knife holder (33), at least one threaded bore in the knife (10) is associated with each slot, and a screw (21) extends through the bore and the slot (11).

17. Machine as in Claim 16, characterized in that the knife (10) has several threaded bores associated with each slot (11) and distributed along it.