

[54] **CIRCULAR BLADE APPARATUS FOR SLITTING WEBS OF MATERIAL**

[75] Inventor: **Hellmuth Lange**, Dusseldorf-Nord, Germany

[73] Assignee: **Jagenberg-Werke AG**, Dusseldorf, Germany

[22] Filed: **Oct. 16, 1973**

[21] Appl. No.: **407,013**

[30] **Foreign Application Priority Data**

Nov. 11, 1972 Germany..... 2255275

[52] U.S. Cl..... **83/501; 83/504**

[51] Int. Cl..... **B26d 1/16**

[58] Field of Search 83/501, 502, 503, 507, 83/498, 499, 504

[56] **References Cited**

UNITED STATES PATENTS

453,380	6/1891	Tincher.....	83/502 X
3,041,907	7/1962	Gallagher, Jr.	83/502 X
3,186,281	6/1965	Wingen.....	83/501 X
3,511,123	5/1970	Smith.....	83/502 X

Primary Examiner—J. M. Meister

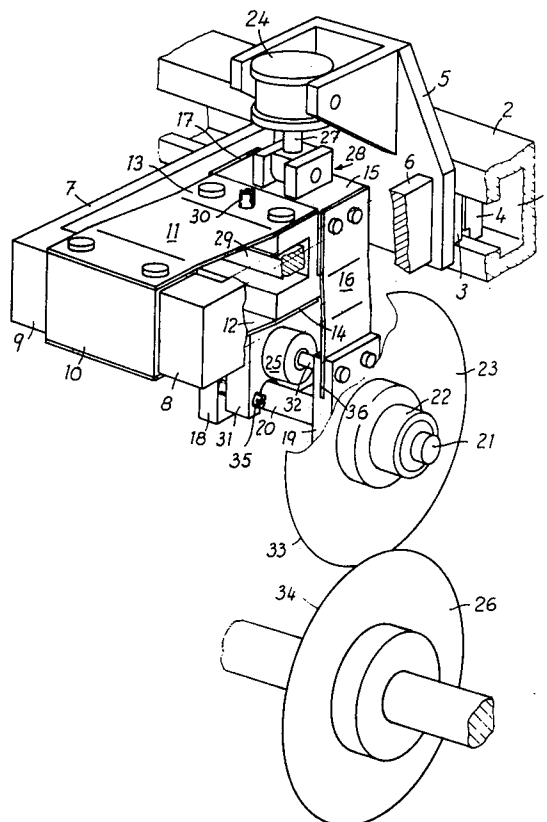
Attorney, Agent, or Firm—Burgess, Dinklage & Sprung

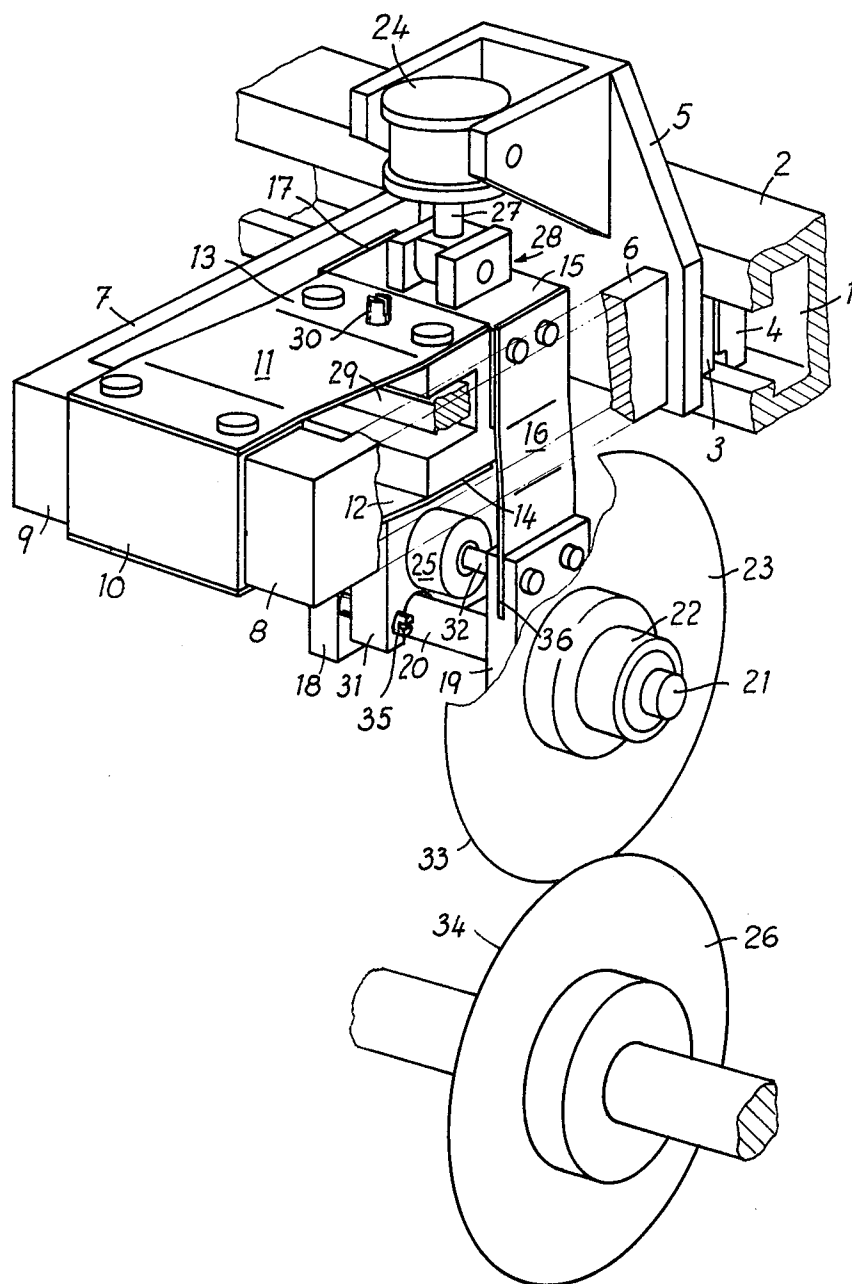
[57]

ABSTRACT

In an apparatus for slitting a web of material such as paper continuously passed therethrough and including a first circular blade rotatably mounted about an axially fixed first shaft, a cooperating second circular blade rotatably mounted about an axially displaceable second shaft, and a carriage for said second shaft, the improvement which comprises a first pair of spaced parallel leaf springs each connected fixedly at one end to said carriage, coupling block carried by the other ends of said first pair of leaf springs, a second pair of spaced parallel leaf springs each connected at one end to said coupling block, the planes of said second pair of springs being substantially perpendicular to those of the first pair of springs and perpendicular to the axis of said second shaft, said second pair of springs at their other ends carrying said second shaft, means for displacing said coupling block relative to said carriage with flexing of said first pair of springs thereby to displace the axis of the second circular blade toward the axis of said first circular blade, and means for displacing the other ends of said second pair of springs with flexing thereof thereby to displace the axis of said second circular blade longitudinally and bring the second circular blade against the first circular blade in working relationship relative to said first circular blade.

4 Claims, 1 Drawing Figure





CIRCULAR BLADE APPARATUS FOR SLITTING WEBS OF MATERIAL

The invention relates to an apparatus for slitting webs of material, especially paper webs or the like, with systems for the adjustment of an upper circular knife to the cutting edge of a lower counterknife, the upper circular knife performing both a plunging and an engaging movement.

Slitting apparatus which operates on the principle of circular knife shearing and which is used for slitting moving webs of material must, for many different, generally known reasons, be constructed in such a manner that, in relation to an adjustable and fixable lower knife, an upper knife will be able to be swung out of the plane of the web of material and thus to be moved out of cutting position. There is also the requirement that, in order to perform a proper cutting action, the cutting edges of the two circular knives have to be urged against one another with a certain force. Among other things, this is intended so as to enable the upper knife to return to the cutting position as quickly as possible after a disturbance of the cutting action so as to resume slitting of the moving web as soon as possible.

To meet these requirements, the prior art discloses slitting systems in which the adjusting and engaging movements of the upper knife are made possible by sliding guide means. These sliding guide means all have the disadvantage that they have to be manufactured precisely and given special maintenance so that they may be able to perform perfectly the function ascribed to them. In other words, care must be taken to avoid any contamination of the guiding means and to provide sufficient lubrication to prevent premature wear of the guiding means. Wear and tear or inadequate lubrication impair the freedom of movement and operating accuracy of the circular knife. This disadvantage manifests itself in the knife in the form of a broken cutting edge, because due to its restricted freedom of movement the knife can be moved only in a jerky manner. Whether the guidance is too tight or the guide clearance is too great, or whether the trouble is wear in the guide means itself, the result will ultimately be poor quality cutting.

It is accordingly an object of the invention to provide an apparatus for slitting webs of material in which the disadvantages listed above are avoided.

These and other objects and advantages are realized in accordance with the present invention which includes the conventional features such as a first circular blade rotatably mounted about an axially fixed first shaft, a cooperating second circular blade rotatably mounted about an axially displaceable second shaft and a carriage for said second shaft. The improvement in accordance with the invention comprises a first pair of spaced parallel leaf springs each connected fixedly at one end to said carriage, a coupling block carried by the other ends of said first pair of leaf springs, a second pair of spaced parallel leaf springs each connected at one end to said coupling block, the planes of said second pair of springs being substantially perpendicular to those of the first pair of springs and perpendicular to the axis of said second shaft, said second pair of springs at their other ends carrying said second shaft, means for displacing said coupling block relative to said carriage with flexing of said first pair of springs thereby to displace the axis of the second circular blade toward

the axis of said first circular blade, and means for displacing the other ends of said second pair of springs with flexing thereof thereby to displace the axis of said second circular blade longitudinally and bring the second circular blade against the first circular blade in working relationship relative to said first circular blade.

Advantageously, said means for displacing said coupling block relative to said carriage comprises a cooperating first piston and first cylinder each connected to one of said coupling block and said carriage, and means for displacing said first piston relative to said first cylinder. Similarly, the means for displacing the other ends of said second pair of springs comprises a cooperating second piston and second cylinder each operatively connected to one of said coupling block and said other ends of said second pair of springs, and means for displacing said second piston relative to said second cylinder.

Viewed otherwise, the controlling members for the second circular blade are linked in the manner of a parallelogram. These controlling members consist of a plurality of pairs of leaf springs arranged in series, the last pair having at their free ends a circular mounting for the second blade. Furthermore, the controlling members are disposed in relation to one another such that their planes of action form an approximately right angle. The displacement of the movable ends of the leaf spring pairs advantageously is limited by stops and set screws.

The invention thus provides completely functional and maintenance-free control members of inexpensive construction in place of the expensive guiding means which have hitherto been disclosed for the required knife movements. In addition, in contrast to the difficulty of operating unmaintained or excessively stiff sliding guide means which permit naught but jerky movements, the wear-free leaf spring guides permit a very precise and gentle movement of the upper circular knife.

An embodiment of the invention is represented in the drawing and will be further described hereinafter.

The slitting device shown in the drawing comprises a crossbeam 2 for carrying the movable upper knife of a slitting apparatus. The crossbeam 2 has a longitudinal channel 1 along which a guide block 3 and a cooperating clamping block 4 are longitudinally displaceable. A bracket mount or carriage 5 carries the blocks 3 and 4, as well as a clamp actuator or lock (not shown). In the lower part of this bracket mount 5 there are two parallel cantilever arms 6 and 7 which at their free ends 8 and 9 carry an intermediate piece 10. This intermediate piece 10 in turn carries a first pair of parallel spaced leaf springs 11 and 12 and at the same time forms the fixed point of the slitting knife guiding system. The movable ends 13 and 14 of the leaf springs 11 and 12 accommodate therebetween a coupling block 15 which in turn forms the fixed point for a second pair of parallel spaced leaf springs 16 and 17 whose planes are approximately at right angles to the planes of springs 11, 12. To the movable ends 16 of this second pair of leaf springs 16, 17 are fastened blocks 18 and 19 which are spaced apart by rod 20. Rod 20, extending through and beyond the block 19, at its free end 21 carries the bearing 22 for the upper circular knife 23.

The movements of the upper circular knife 23, i.e., both the adjusting and the engaging movement, are performed by means of operating cylinders 24 and 25.

Whereas operating cylinder 24 produces the vertically oriented adjusting movement of the upper circular knife 23 into the cutting range of the lower circular knife 26, operating cylinder 25 is provided for longitudinal axial movement whereby the upper circular knife 23 engages the lower circular knife 26. The operating cylinder 24 articulated to the bracket mount 5 drives the coupling block 15 by means of its piston 27 in articulation 28 and moves it downwardly against the resilient force of the leaf springs 11 and 12 towards the lower circular knife 26. Limitation of this adjusting movement is achieved by a stop bar 29 disposed between the cantilever arms 6 and 7. By means of a set screw 30 which contacts the stop bar 29 the adjustment depth to which the upper knife 23 plunges into the web of material may be regulated. The operating cylinder 25 which produces the engaging movement, i.e., the axial movement of the upper knife 23, is disposed on an extension 31 of the coupling block 15. From this extension 31 the operating cylinder 25 with its piston rod 32 pushes block 19 longitudinally of the axis of the upper knife until the cutting edge 33 of the upper knife 23 is in a shearing position with the cutting edge 34 of the lower circular knife 26. To prevent transmitting the full working pressure of the operating cylinder 25 to the two cutting edges 33 and 34 and thereby causing possible damage to these edges, there is provided on extension 31 a set screw 35 which bears against the block 18 and thereby determines the length of the engagement stroke and limits the cutting edge pressure.

It will be appreciated that the instant specification and examples are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. In an apparatus for slitting a web of material such as paper continuously passed therethrough and including a first circular blade rotatably mounted about an axially fixed first shaft, a cooperating second circular blade rotatably mounted about an axially displaceable

second shaft, and a carriage for said second shaft, the improvement which comprises a first pair of spaced parallel leaf springs each connected fixedly at one end to said carriage, a coupling block carried by the other ends of said first pair of leaf springs, a second pair of spaced parallel leaf springs each connected at one end to said coupling block, the planes of said second pair of springs being substantially perpendicular to those of the first pair of springs and perpendicular to the axis of said second shaft, said second pair of springs at their other ends carrying said second shaft, means for displacing said coupling block relative to said carriage with flexing of said first pair of springs thereby to displace the axis of the second circular blade toward the axis of said first circular blade, and means for displacing the other ends of said second pair of springs with flexing thereof thereby to displace the axis of said second circular blade longitudinally and bring the second circular blade against the first circular blade in working relationship relative to said first circular blade.

2. The apparatus according to claim 1, wherein said means for displacing said coupling block relative to said carriage comprises a cooperating first piston and first cylinder each connected to one of said coupling block and said carriage, and means for displacing said first piston relative to said first cylinder.

3. The apparatus according to claim 1, wherein said means for displacing the other ends of said second pair of springs comprises a cooperating second piston and second cylinder each operatively connected to one of said coupling block and said other ends of said second pair of springs, and means for displacing said second piston relative to said second cylinder.

4. The apparatus according to claim 2, wherein said means for displacing the other ends of said second pair of springs comprises a cooperating second piston and second cylinder each operatively connected to one of said coupling block and said other ends of said second pair of springs, and means for displacing said second piston relative to said second cylinder.

* * * * *

45

50

55

60

65