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Aspinwall et al.

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[54] **KNIFE EDGE ENDLESS LOOP BOOK CUTTER**

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[52] **U.S. Cl.** **83/174**; 83/409.1; 83/435.2; 83/788; 83/809; 83/820

[51] **Int. Cl.** **B26d 1/46**

[58] **Field of Search** 83/174, 788, 809–813, 83/820, 435.2, 409.1, 409.2

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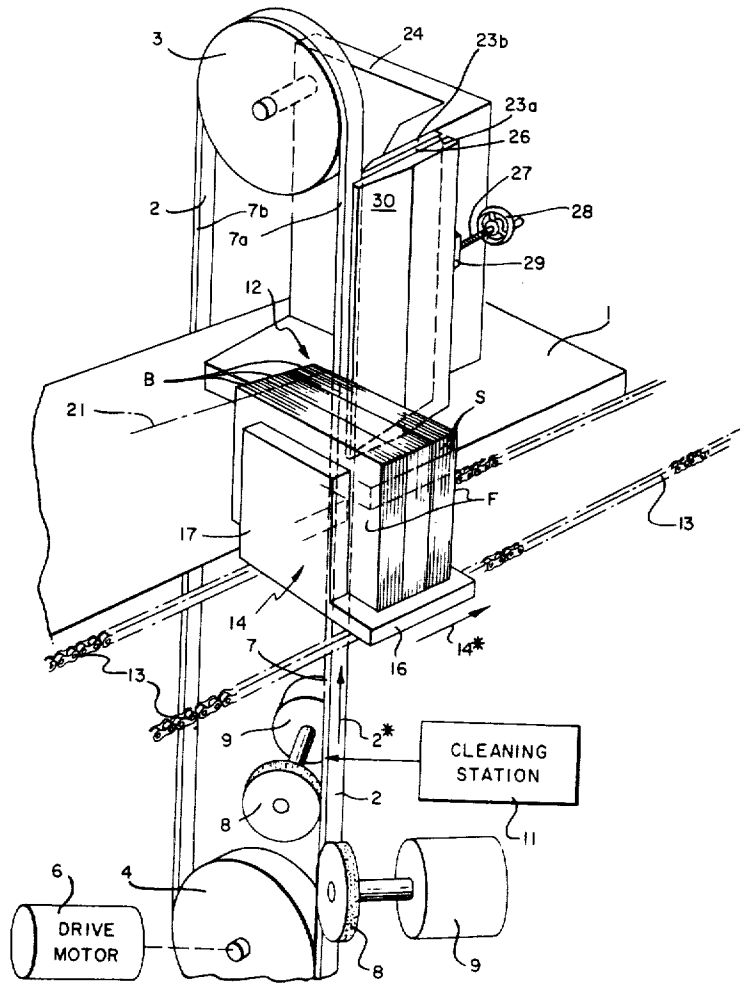
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[57] **ABSTRACT**

A band type of knife has a bevelled edge for cutting unbound sheets of a book held on a conveyor. The saw band is held by guides in the path of the book with the bevel at right angles to the face of the book sheets and with the band inclined relative to the sheets at an angle convergent in the direction of band travel so that the band saw pulls away from the uncut portion of the sheets.

7 Claims, 3 Drawing Figures



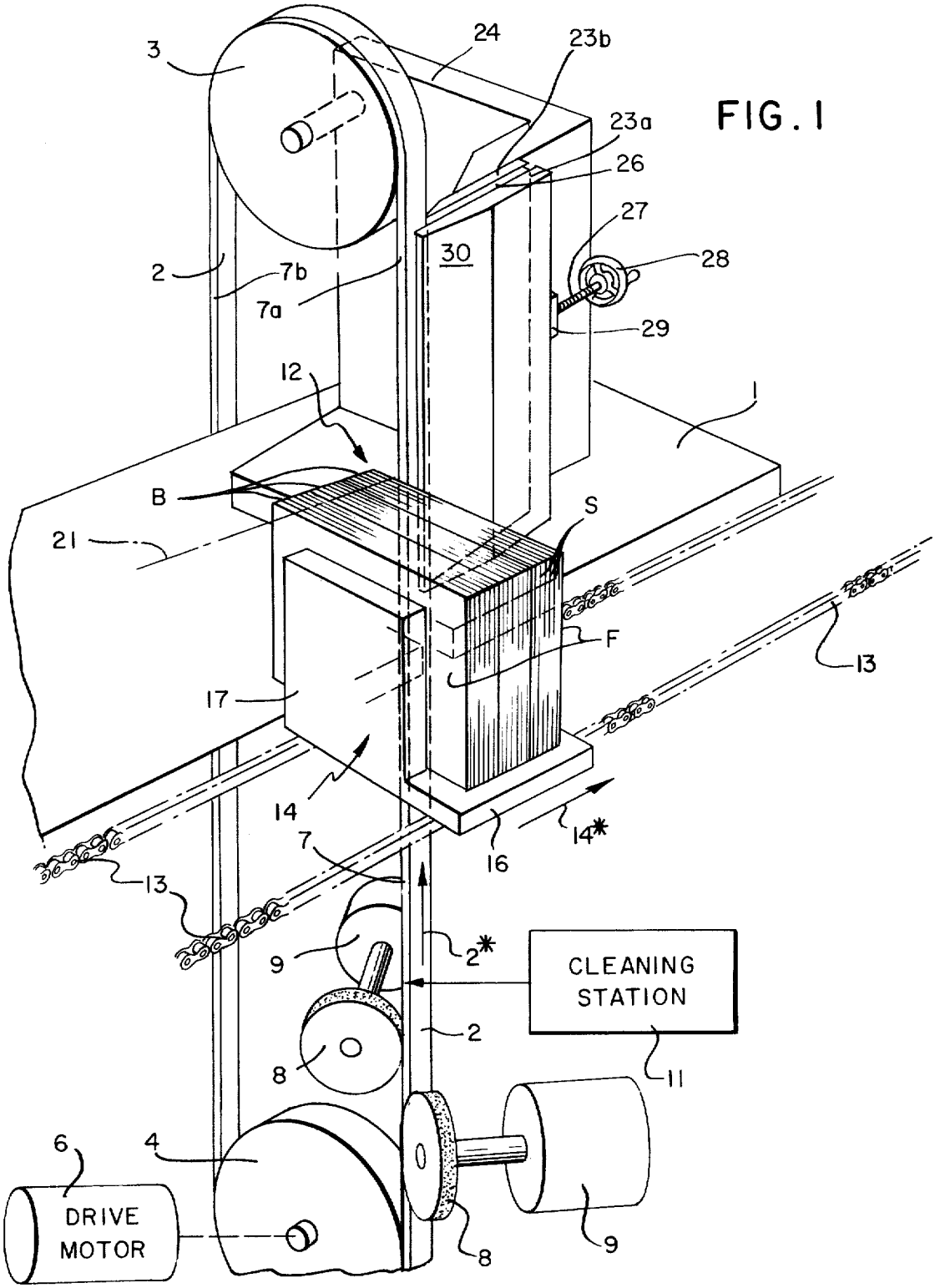

3
24
23b
23a
26
27
28
29
30
2
7b
7a
12
1
B
21
S
F
13
17
14
14*
16
7
13
9
2*
CLEANING STATION
2
11
8
6
4
DRIVE MOTOR
8
9

FIG. 1

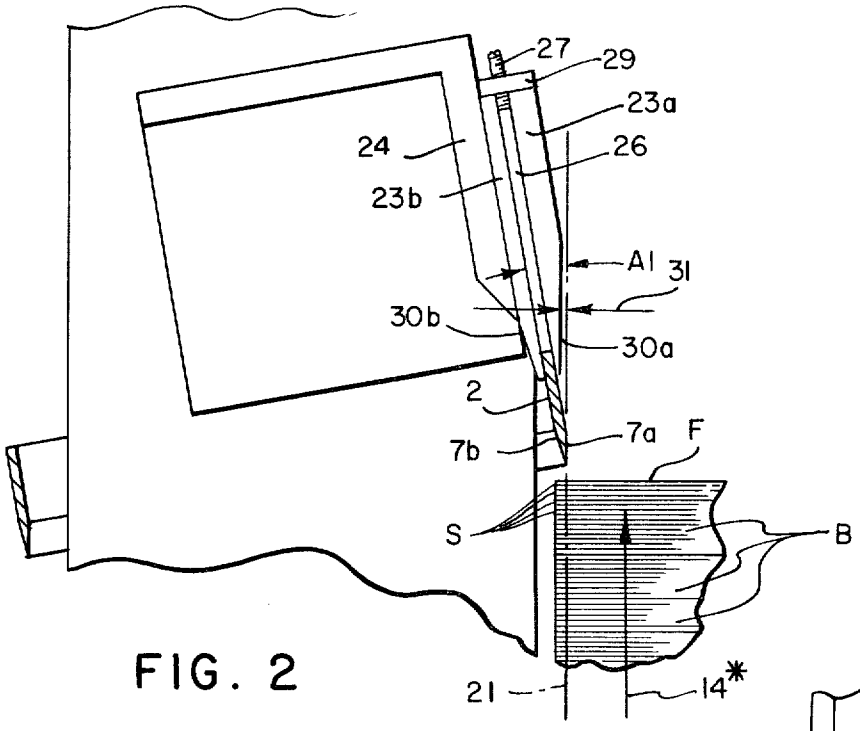

27
29
23a
24
26
23b
A1
31
30b
30a
2
7b
7a
F
S
B
21
14*

FIG. 2

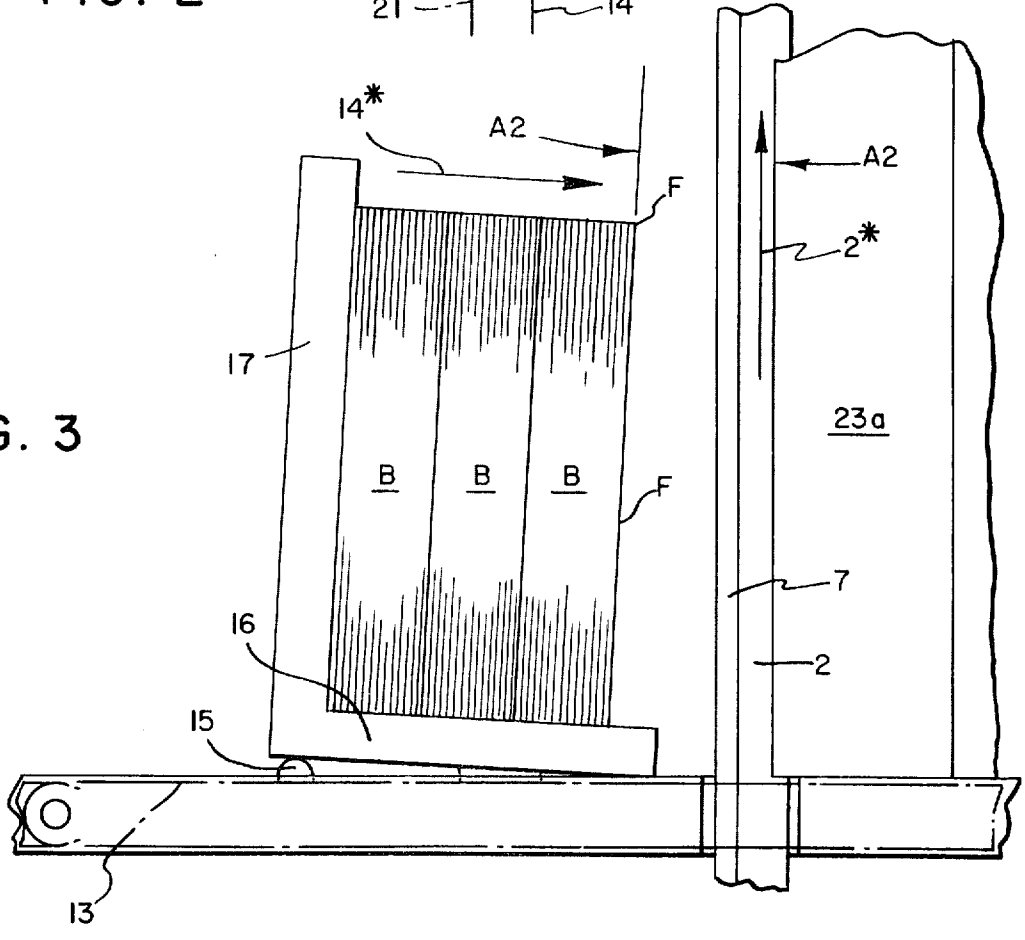

14*
A2
F
A2
2*
17
23a
B
B
B
F
7
16
2
15
13

FIG. 3

KNIFE EDGE ENDLESS LOOP BOOK CUTTER

BACKGROUND OF THE INVENTION

Knife edge band saws have been used for cutting various sheet materials such as leather, but as hitherto available such knife edge band saws have not been used for cutting paper, particularly paper in the form of the sheets of a book.

Accordingly the object of the present invention is to provide book or other paper sheet cutting apparatus with a band knife which will make a clean cut through the sheets with very little force applied to feed the sheets, and which cuts off highly salvagable scrap with little damage to the scrap.

STATEMENT OF INVENTION

According to the invention book cutting apparatus comprises a travelling knife edge cutter including an endless loop carrying a cutting edge and means to guide the loop through a straight portion at cutting station; a book conveyor for moving a book through the cutting station, and means on the conveyor for holding the book with the face of the book sheets facing substantially parallel to the cutting edge; the cutting edge having a bevel angle and the loop guide means holding the cutting edge inclined to the face of the sheets laterally of loop travel substantially at the bevel angle and with the bevel normal to the sheet face.

Preferably, in addition to the bevel inclination, there is a second inclination between the blade and sheet face at an angle convergent in the direction of cutter travel so that the cutting edge pulls on the paper in a direction away from the uncut portion of the sheets.

DRAWINGS

FIG. **1** is an isometric view of a band saw book cutting apparatus according to the invention;

FIG. **2** is a fragmentary plan view of the apparatus of FIG. **1**; and

FIG. **3** is an enlarged side view of a portion of the apparatus.

DESCRIPTION

Shown in FIG. **1** is a band knife type of book cutting apparatus comprising a table **1** on which is mounted a band knife comprising an endless, knife edge, band **2** supported on idler rolls **3** and a drive roll **4** connected to a drive motor **6**, and driven by the motor in the direction indicated by the arrow **2***. As explained more fully hereinafter, the endless band **2** has a cutting edge **7** with two bevel angles **7***a* and **7***b* which in their travel are continuously honed by abrasive wheels **8** driven by motors **9**. After being sharpened by the abrasive wheels **8** the band **2** passes a cleaning station **11** which removes abrasive and book cutting byproducts from the cutting edge **7**. The band **2** then extends on a straight portion through a book cutting station **12**.

A chain conveyor **13** carries a series of book holders **14**, of which one is shown, through the cutting station. The book holder comprises a base **16** with a fixed rear wall **17**. One or more books B are pressed forwardly by the wall **17**, with the portion of the book to be trimmed off extending beyond a trim line **21**. Each book B comprises a number of collated sheets S, the outer sheets of the book comprising a face F. The chain **13** conveys the book holder in the direction indicated by the arrow **14***.

As shown in FIGS. **1**, **2** and **3**, the straight portion of the bank passes between guide plates **23***a* and **23***b* mounted on a standard **24** extending upwardly from the table **1**. A back up plate **26** is slidingly held in the guide way between the guide plates and abutting the rear edge of the band. A screw **27** driven by a hand wheel **28** and threaded in a block **29** adjustably urges the sliding plate **26** against the rear edge of the band **2** so as to hold the cutting edge of the band beyond the guide plates **22** and **23**.

According to one aspect of the invention the guide plates **23***a* and **23***b* are inclined to the face F of the leading book B such that the plane of the bevelled edge **7***a* is perpendicular (normal) to the sheet face F. (FIG. **2**) Typically the bevel angle A1 is 7½° to 10°. Preferably the tapered forward end **30***a* of the guide plate **23***a* is tapered parallel to the bevel **7***a* with a slight clearance **31** inwardly of the plane of the bevel edge **7***a*. The other plate **23***b* has a similar taper **30***b*. Also preferably the plate is very slightly inclined (e.g. 1°) away from the trim line **21**. These arrangements allow the bevel angle **7***a* of the cutting edge to be held very precisely by the guide plates **23***a* and **23***b* at the normal angle to the face F of the sheets S to be cut insuring a clean cut. As successive scrap strips are cut from the sheets outside the trim line **21** they pass the tapered end **30***b* of the guide plate **23***b* with minimum interference, and the cut book edge on the trim line clears the taper **30***a* of the guide plate **23***a*.

In another aspect of the invention shown most clearly in FIG. **3** the book holder **14** is inclined on the chain **13** at an angle selected by a wedge **15** under its base **16**. Consequently the forward face F of the clamped books B is inclined such that the vertical angle A2 included between the cutting edge **7** (which in this case is parallel to the direction **2*** of band movement) of the band **2** first enters the face F of the book at the book edge F*. That is the angle between the direction of band movement **2*** and sheet face F is convergent in the upward direction of band movement. Although this angle A2 is somewhat exaggerated in FIG. **3** it may be a few degrees, for example, 1° or 2°.

With the knife edge cutter at a blade speed of 2,500 feet per minute, for example, rapid, high quality trimming of telephone books, dictionaries and other very thick books can be achieved with a very low drive force in the order of 10 to 20 lbs. Such a drive force permits the use of gravity feed. Very clean, unwrinkled and untorn scrap is trimmed from the book without frictional engagement or jamming of the plate in the kerf at the trim line. Power consumption in driving the cutting band is substantially below that required for prior forms of trimming cutters. The band is not only substantially less expensive (e.g. 50 percent) but also, by virtue of its being continuously sharpened, can be used for as long as one month without being removed for honing or replacement. In contrast a guillotine knife in the same service must be removed and sharpened approximately once a week. In addition to the above advantages, the trim of the book is accomplished with a very high quality cut.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

We claim:

1. Apparatus for cutting the sheets of a book comprising:

a travelling knife edge cutter including an endless loop carrying a cutting edge and means to guide the loop through a straight portion at a cutting station;

a book conveyor for moving a book through the cutting station, and

means on the conveyor for holding the book with the face of the book sheets facing substantially parallel to the cutting edge,

the cutting edge having a bevel angle and the loop guide means holding the cutting edge inclined to the face of the sheets laterally of loop travel substantially at the bevel angle and with the bevel normal to the sheet face, and

the book holding means and cutter loop guide means holding the sheet face at an angle to the straight portion convergent in the direction of cutter travel with the plane of the sheet inclined forwardly in the direction of book movement so that the cutting edge pulls on the sheets away from the uncut portion of the sheets.

2. Apparatus according to claim 1 wherein the convergent angle is 1° to a few degrees.

3. Apparatus according to claim 1 including cutting edge sharpening means disposed in contact with the bevel for continuous sharpening of the edge, and wherein the loop guide means includes a back up for the loop adjustable to advance the blade outwardly of the guide means after sharpening while maintaining the normal inclination of the bevel relative to the sheet face.

4. Apparatus according to claim 1 wherein the cutting edge has a second bevel angle on the opposite side of the loop from the first said bevel angle.

5. Apparatus according to claim 4 wherein the loop guide means includes two opposed plates forming a guideway for the straight portion of the loop therebetween, one of the plates abutting the loop on the side of the first bevel angle and having a tapered face substantially parallel to the first bevel angle.

6. Apparatus according to claim 5 wherein the tapered face is slightly displaced from the plane of the first bevel angle toward the loop.

7. Apparatus according to claim 5 wherein the other guide plate has a tapered face substantially parallel to the second bevel angle.

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