April 24, 1962 J. P. HAAS 3,030,841

BLADE MOUNTING

Filed Dec. 18, 1958 2 Sheets-Sheet 1

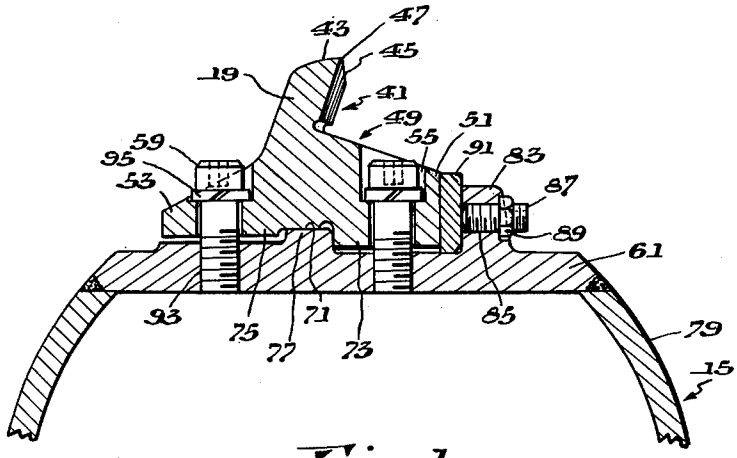


Fig. 1.

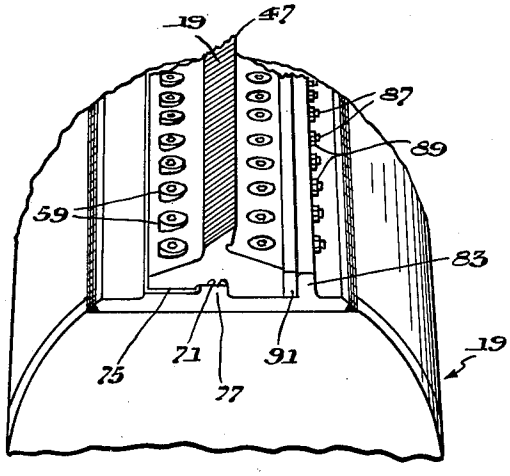


Fig. 2.

INVENTOR.
JAMES P. HAAS.

BY
C. Daniel Cornish
his ATTORNEY.

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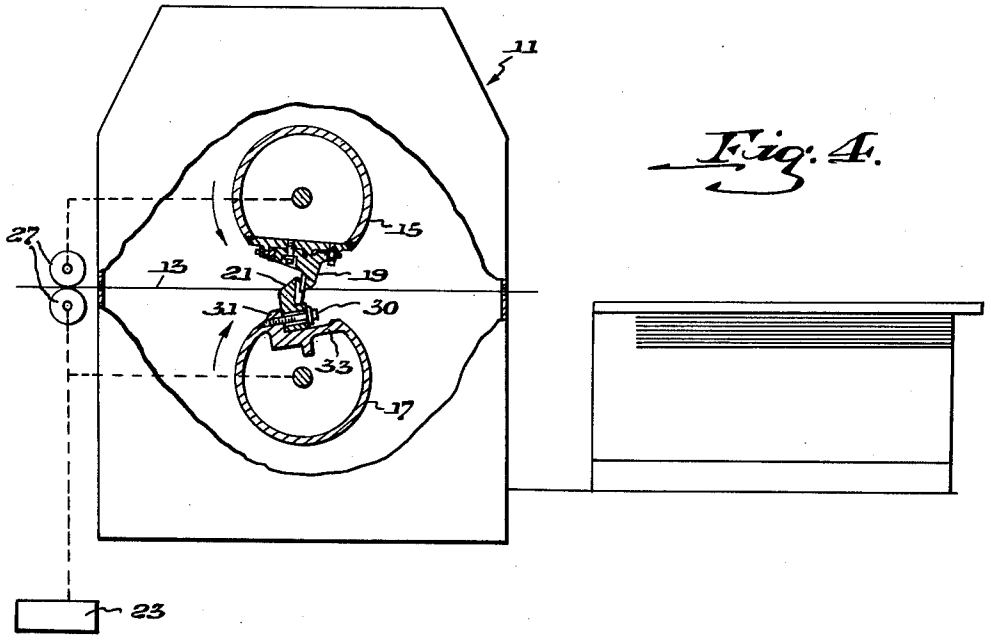


Fig. 4.

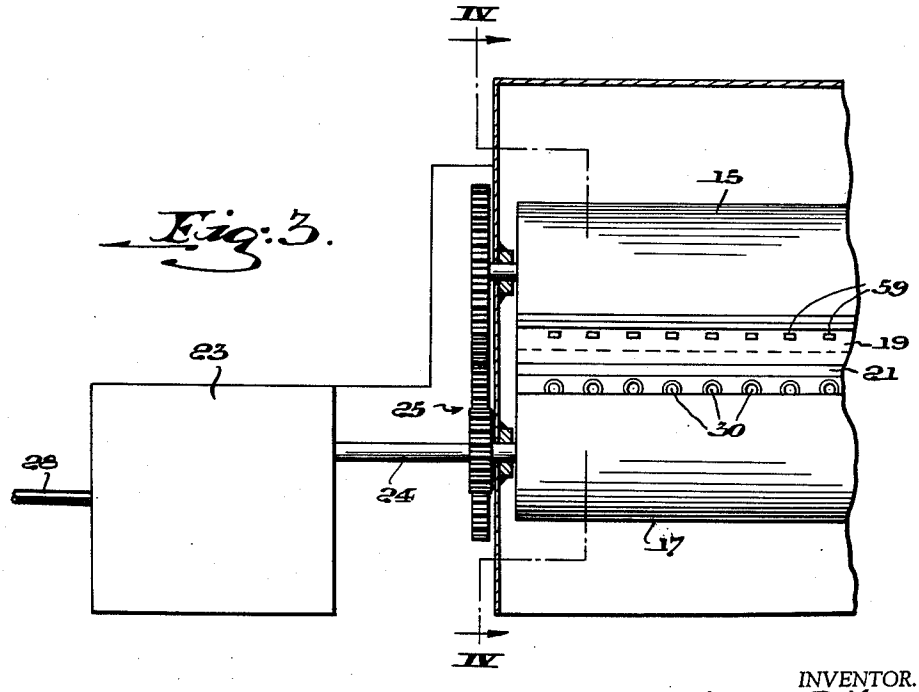


Fig. 3.

INVENTOR.
JAMES P. HAAS.

BY
C. Daniel Cornish
his ATTORNEY.

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BLADE MOUNTING

James P. Haas, Baltimore, Md., assignor to Koppers Company, Inc., a corporation of Delaware

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This invention relates generally to rotary cut-off knives and more particularly to an apparatus for mounting blades on rotating rolls of rotary cut-off knives.

Rotary cut-off knives are used in many industries to cut continuous sheets of material. For example, in the corrugated board industry, such knives are used to cut continuous lengths of corrugated board into blanks which may be printed, slotted and then folded into boxes. One machine for cutting such board is described in co-pending application Serial No. 55,987, now Patent No. 2,626,-226 which is assigned to the assignee of this invention.

The rotary cut-off knives, as used heretofore, comprised two tangentially opposed axially spaced rolls each having attached to the periphery of the roll a longitudinally extending knife blade which is tapered lengthwise. Normally the lower roll carries a fixed knife blade which is not adjustable. The upper roll normally carries an adjustable blade which can be skewed angularly slightly from one end of the roll relative to the other end. During or after the initial adjustment, the upper blade is clamped tightly. The rolls are rotated by a suitable drive means, and the material to be cut in the form of long sheets is fed longitudinally between the rolls at the same surface speed as the rolls. The knives meet across the material to shear the material by a slight scissors action every time the rolls make one revolution.

Adjustment of the cut-off blades is a critical and delicate operation. For example, the area of contact between blades, which causes the shearing of the material, travels from one end of the rolls to the other as the rolls turn. This proper contact is obtained by skewing one of the blades slightly from one end of the rolls to the other. To obtain this proper contact, the operator must check the quality of his adjustment initially by rotating the rolls and letting the blades shear a sheet of paper such as newspaper.

It is desirable that these cut-off blades operate at high surface speeds. Also, it may be necessary to cut thick material such as double-walled corrugated board.

The apparatus used for adjusting and holding the knife blades heretofore has been difficult to manipulate, and has been unsatisfactory in maintaining accuracy at high surface speeds or during the cutting of heavy material.

This invention eliminates the aforesaid problems by providing a novel light-weight apparatus comprising a means including a pivot for easily adjusting a blade adapted to pivot thereon and means for rigidly holding the adjustment of the blade.

The above and further novel features of the invention will appear more fully from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are not intended as a definition of the invention but are for the purposes of illustration only.

FIG. 1 is a detail view partially in cross section of an embodiment of a blade and mounting therefor made according to this invention.

FIG. 2 is a partial isometric view of FIG. 1.

FIG. 3 is a partial elevation and cross section of a rotary cut-off knife having the embodiment of FIG. 1.

FIG. 4 is a schematic of a cut-off knife taken on line IV—IV of FIG. 3 showing the embodiment of FIG. 1.

Referring to FIG. 4, there is illustrated a cut-off machine 11 of the type used to cut sheets of longitudinally moving material as in the paper box making industry where corrugated board 13 may be fed to machine 11 continuously from a special machine (not shown) called a "corrugator." The boards travel at speeds in excess of 700 feet per minute between rolls 15 and 17 to which knives 19 and 21 are attached. In this case it is desirable that upper roll 15 and lower roll 17 of the cut-off knife be traveling at the same linear speed as the board when a cut is made by knives 19 and 21 so that the cut is even. It is further desirable that the outgoing strips of board fed from the corrugator at a constant rate of speed are cut into lengths varying, for example, from thirty inches to 180 inches. Conventionally, 36 inch diameter rolls areu sed and these rolls are accelerated and decelerated to control the angular speed of the rolls to bring the blades 19 and 21 to board speed for shearing. Because of these factors a special drive means 23 shown schematically, is required. This may be a drive of the type disclosed in co-pending United States patent application Serial No. 55,978 as shown schematically in FIGS. 3 and 4. Drive 23 rotates rolls 15 and 17 through shaft 24 and gear train 25 and rotates feed rolls 27 by means of a suitable shaft whose speed of rotation is controlled by drive 23. Advantageously drive 23 is actuated through shaft 28 which is a common drive with the "corrugator" so that the speed of the rolls 15 and 17 can further be controlled with relation to the speed of the board 13 and rolls 27.

The lower knife blade 21 is illustrated in FIG. 4 as being fastened to lower roll 17 in the manner heretofore known. The positioning of this lower blade is fixed. As illustrated, socket head cap screws 30 are threaded into shoulder 31 of plate 33 so that knife 21 is rigidly held against shoulder 31 which runs longitudinally along the top of roll 17. Lower knife blade 21 cooperates with upper blade 19 as these blades rotate to shear material fed therebetween.

Heretofore, the upper blade was attached to a roll and was mounted in substantially the same way as the lower knife blade 21 except that the upper knife had a plurality of set screws threaded through the knife blade body on either side of screws, like screws 30, into engagement with a supporting plate like supporting plate 33. These set screws had the primary disadvantages that they were inadequate to adjust the upper blade as accurately as desired and were inadequate to hold their adjustment once it was obtained.

In the embodiment of the invention, shown in FIGS. 1 and 2, the disadvantages mentioned above are overcome. Upper blade 19 has an upper portion, generally designated 41, which has two tapered surfaces 43 and 45 forming an edge 47. The lower portion, generally designated 49, of the blade extends on both sides of the upper portion so as to provide two anchoring flanges 51 and 53. A plurality of holes 55 in these flanges extend longitudinally in a line along the length of each anchoring flange as shown in FIG. 2. In one embodiment of this invention these anchoring flanges 51 and 53 have formed therein a longitudinal recess 71, which in cross section is substantially rectangular, to provide two shoulders 73 and 75, shoulder 73 being thicker than the shoulder 75. Shoulder 73 is adapted to contact the side of a raised portion of a plate 61 which forms a saddle 77. The bottom of recess 71 rests on and is positioned by this saddle 77.

Plate 61 is advantageously welded to the outside 79 of roll 15 as shown in FIG. 1. Shoulder 83 of plate 61 runs longitudinally in parallel relation to the axis of roll 15 and has a plurality of threaded holes 85 formed therethrough whose centers fall substantially on a line parallel to the face of the shoulder 83. Screws 87 thread into holes 85 so as to contact spacer 91 which is interposed between shoulder 83 and anchoring section 51. Advan-

tageously these screws **87** have slots in one end which are adapted to receive a screw driver for turning the screws and nuts **89** are tightened on screws **87** against shoulder **83** to hold the screws in a desired position. Bolts **59** thread into a plurality of holes **93** in plate **61** whose centers correspond to those of holes **55**. The heads of these bolts may be turned by a socket wrench so as to thread into holes **93**. Lock washers **95** may be used to secure bolts **59** from loosening by being squeezed against the face of holes **55** in anchoring flanges **51** and **53**.

In operation, knife blade **19** is placed on saddle **77**, bolts **59** are screwed into plate **61** clamping the blade against the saddle. Screws **87** are then placed in holes **85** in three or four locations and screwed inwardly against spacer **91** to push the side of shoulder **73** against the face of saddle **77**. Spacer **91** prevents marking of blade **19** by screws **87**. By adjusting bolts **59** blade **19** pivots on saddle **77**. This causes the tip **47** of the blade to move forward or backward as desired and the desired twisting or skewing of the blade is thus obtained. After the blade is properly positioned the remaining screws **87** are threaded against spacer **91** and nuts **89** are tightened. After the proper adjustment and tightening is made, the upper and lower rolls **15** and **17** are revolved so that knife blades **19** and **21** shear board **13** fed therebetween by a slight scissors action that is induced by the meeting of the blades.

In an embodiment of this invention wherein the upper and lower knife blades were 26 inches long, tests have shown that when one end of the upper blade was kept stationary at a reference position, the other end of this blade could be made to move .080 inch forward from the reference position, then .080 inch backward from the reference position. Thus the total travel of one end of the blade tip was .160 inch. Furthermore, it was found that micrometer adjustments could be made and in operation these adjustments were held even when cutting material of relatively heavy gage were made at high surface speeds.

The blade mounting of this invention as described above, is sturdier than those heretofore and has the advantages that it is easy to make accurate blade adjustments. This invention can be used to great advantage with light weight rolls to cut heavy as well as light gage material at high as well as low surface speeds while maintaining accuracy of adjustment.

What is claimed is:

1. Apparatus for adjustably retaining a longitudinally extending knife blade body upon a support therefor, said knife blade body comprising a longitudinally extending portion having a cutting edge along the outer extremity thereof with first and second anchoring flanges projecting laterally from opposite sides of said portion and extending longitudinally thereof, said retaining apparatus comprising a fulcrum on said support for engagement with the underside of said knife blade body, said fulcrum extending lengthwise of said knife blade body and being of sufficient height to permit pivoting of said knife blade body thereover relative to said support, means for preventing lateral movement of said knife blade body relative to said fulcrum, first fastening means connecting said first anchoring flange to said support to one side of said fulcrum, second fastening means connecting said second anchoring flange to said support to the opposite side of said fulcrum from said first fastening means, said first and second fastening means being differentially adjustable and cooperating to pivot and secure successive increments of said knife blade body relative to said fulcrum whereby said knife blade body is fixedly warped to accurately locate and retain said cutting edge in a skewed position relative to said support.

2. Apparatus for adjustably retaining a longitudinally extending knife blade body upon a support therefor, said knife blade body comprising a longitudinally extending portion having a cutting edge along the outer extremity thereof with first and second anchoring flanges projecting laterally from opposite sides of said portion and extending longitudinally thereof, said retaining apparatus comprising a fulcrum on said support for engagement with the underside of said knife blade body, said fulcrum extending lengthwise of said knife blade body and being of sufficient height to permit pivoting said knife blade body thereover relative to said support, means for preventing lateral movement of said knife blade body relative to said fulcrum, a plurality of first screws connecting said first anchoring flange to said support at spaced intervals to one side of said fulcrum, a plurality of second screws connecting said second anchoring flange to said support at spaced intervals to the opposite side of said fulcrum from said plurality of first screws, said first and second screws being differentially adjustable and cooperating to pivot and secure successive increments of said knife blade body relative to said fulcrum whereby said knife blade body is fixedly warped to accurately locate and retain said cutting edge in a skewed position relative to said support.

3. Apparatus for adjustably retaining a longitudinally extending knife blade body upon a support therefor, said knife blade body comprising a longitudinally extending portion having a cutting edge along the outer extremity thereof with first and second anchoring flanges projecting laterally from opposite sides of said portion and extending longitudinally thereof, said retaining apparatus comprising a fulcrum on said support for engagement with the underside of said knife blade body, said fulcrum extending lengthwise of said knife blade body and being of sufficient height to permit pivoting said knife blade thereover relative to said support, a shoulder formed on the underside of said knife blade body and extending longitudinally thereof, an abutment formed on said support extending in the direction of said fulcrum, a plurality of screws threaded through said abutment along the length thereof and projecting therefrom to force said shoulder against said fulcrum, first fastening means connecting said first anchoring flange to said support to one side of said fulcrum, second fastening means connecting said second anchoring flange to said support to the opposite side of said fulcrum from said first fastening means, said first and second fastening means being differentially adjustable and cooperating to pivot and secure successive increments of said knife blade body relative to said fulcrum whereby said knife blade body is fixedly warped to accurately locate and retain said cutting edge in a skewed position relative to said support.

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