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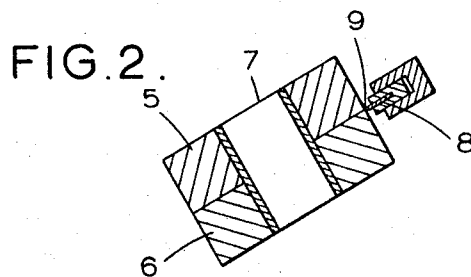
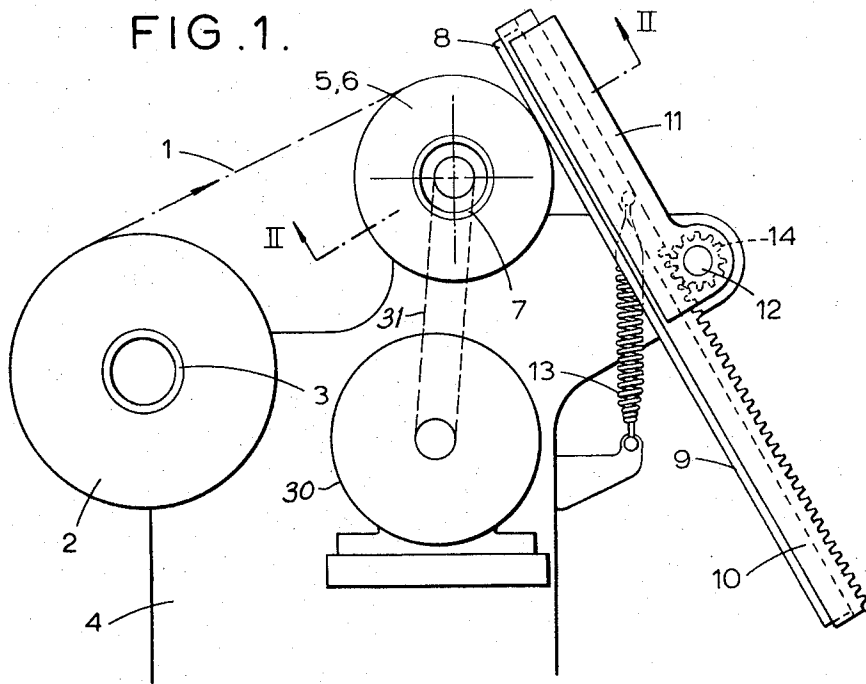
E. R. ARMELIN ET AL

3,452,943

SLITTING KNIVES

Filed April 17, 1967

Sheet 1 of 2



INVENTORS

Edward Roger Armelin  
Arthur Frederick George Haskett

BY

Watson, Cole, Grindle + Watson  
ATTORNEYS

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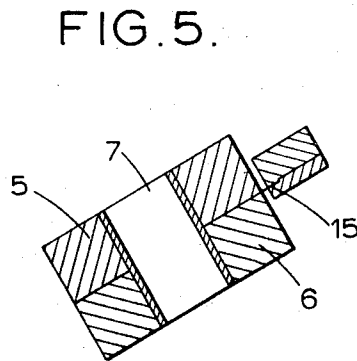
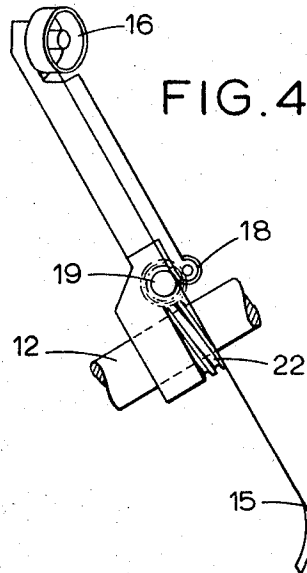
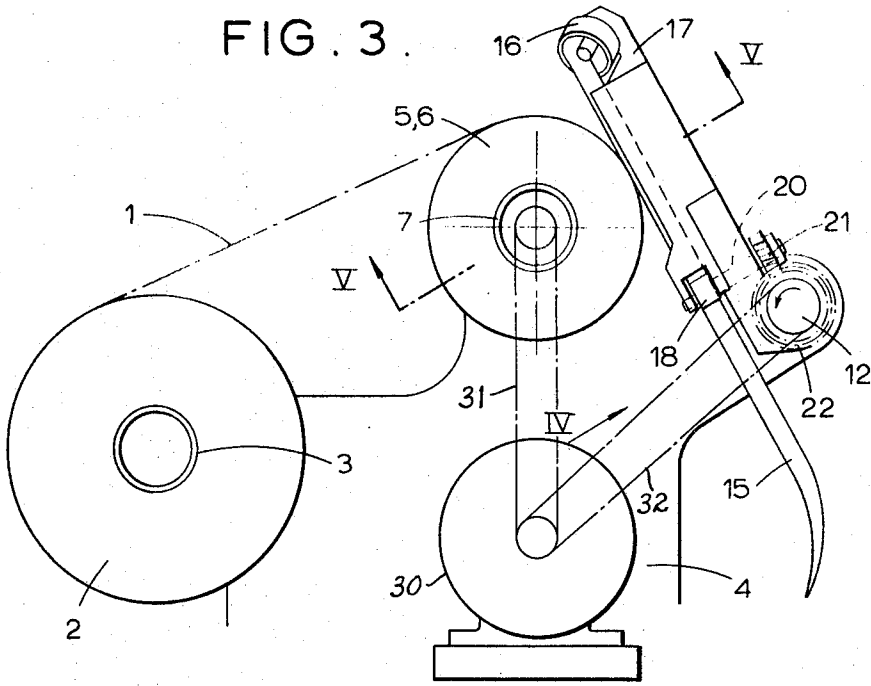
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INVENTORS  
Edouard Roger Armelin  
Arthur Frederick Georg Peaker  
BY  
Watson, Cole, Greville + Watson  
ATTORNEYS

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3,452,943

**SLITTING KNIVES**

Edouard Roger Armelin, Ealing, London, and Arthur Frederick George Plaskett, Orpington, England, assignors to Societe d'Etudes de Machines Speciales, Paris, France, a French company

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4 Claims

**ABSTRACT OF THE DISCLOSURE**

An apparatus for slitting flexible web material wherein a roll of the web to be slit is supported on a first spindle, and rewound onto a second spindle while, at the same time, being slit by a knife resting tangentially on the web.

This invention relates to improvements in slitting knives which are primarily intended for cutting flexible web materials such as paper and cardboard.

It is frequently desired to slit a roll of such flexible web material longitudinally to form a plurality of further rolls of the web in reduced widths. In order that this may be done, the web is unwound from an existing roll, slit as desired and rewound into new rolls.

In some instances it is desirable to slit the web material without applying counter pressure against the slitting knife by the use of a counter knife. In slitting some web materials in this manner, if a clean slit of the material is to be obtained over the whole length of the web material, it has been found to be essential that a razor sharp edge is maintained on the slitting knife or knives. While it has been known to use knives which can be removed and sharpened as necessary, it has been found that this is required more frequently than is desirable, particularly when slitting relatively strong or abrasive materials.

It is an object of the present invention to provide an improved apparatus and method for slitting flexible web materials without the use of a counter knife.

It is a further object of this invention to provide a slitting knife which remains effective for much longer usage than hitherto.

In order that this may be done, the slitting knife is adapted to bear on the web material tangentially as it is rewound, slitting it to form the desired narrower rolls. Further the knife is made much longer than would normally be the case and is provided with an extended cutting edge along its length. In use initially such a knife is brought to bear on the web to be slit with the cutting edge at one end of the knife in contact therewith. As the slitting takes place and the cutting edge on the knife begins to wear, the slitting knife is moved progressively along its length so that a fresh cutting edge is continuously presented to the web.

Accordingly the invention provides apparatus for slitting flexible web material, comprising a framework arranged to support a spindle carrying a roll of said web material for rotation in said framework and further arranged to support a further spindle for rotation in said framework, means for driving said further spindle to rewind said web from said roll onto said further spindle, and a knife pivotally mounted on said framework so as to bear on said web tangentially as it is rewound onto said further spindle and slit the web to form a plurality of narrower web rolls on said further spindle.

According to another aspect of the invention there is provided such apparatus wherein said knife is elongated and has a cutting edge provided therealong, and including

means for progressively moving said cutting edge longitudinally relative to the point at which it contacts said web.

According to a further aspect of the invention there is provided a method of slitting flexible web material comprising unwinding a roll of said web material from a spindle, causing said web material to be rewound onto a further spindle under a knife cutting edge arranged to bear tangentially on said web as it is rewound onto said further spindle and slit said web to form a plurality of narrower web rolls on said further spindle.

According to yet a further aspect of the invention there is provided such a method, wherein during said rewinding said cutting edge is caused to move progressively longitudinally relative to the point at which it contacts said web so as to continually present a fresh part of said cutting edge to said web.

In order to promote a fuller understanding of the invention two embodiments will now be described, by way of example only, with reference to the accompanying drawings of which:

FIGURE 1 is a side elevation of a web slitting machine incorporating a slitting knife of the invention,

FIGURE 2 is a part sectional view taken on the line II—II in FIGURE 1,

FIGURE 3 is a side elevation of a web slitting machine incorporating a further knife of the invention,

FIGURE 4 is a view of the slitting knife taken in the direction of the arrow IV in FIGURE 3, and

FIGURE 5 is a part sectional view taken on the line V—V in FIGURE 3.

Referring now to the drawings, FIGURE 1 shows the general arrangement of the machine for slitting a web into two parts. The web 1 to be slit is on a reel 2 mounted freely on a spindle 3 on the machine frame 4. The web 1 is wound simultaneously, as by an electric motor 30 and a belt 31, onto two reels 5 and 6 mounted on a common further spindle 7 on the machine frame 4. As the web 1 is wound onto these two reels it is slit into the desired two parts by a slitting knife 8 which bears tangentially thereon.

The knife 8 is in the form of a thin strip of steel having a cutting edge 9 formed along its entire or substantially its entire length. In order to support and maintain the knife rigidly against the moving web it is rigidly mounted in a knife holder 10. The knife holder 10 is slidably mounted within an arm 11 which is itself pivotally mounted on the machine frame 4 at a point 12. A tension spring 13 is provided between the arm 11 and the machine frame 4 and arranged so that it maintains the knife in constant slitting engagement with the web 1 as it is rewound onto the reels 5 and 6.

The back of the knife holder 10 has a rack cut thereon which engages with a gear pinion 14 rotatably mounted concentrically to the pivot point 12 of arm 11. Thus it can be seen that if the pinion 14 is rotated it will cause the knife holder 10 and the knife 8 mounted in it to move lengthwise along its mounting in the arm 11, irrespective of the angular position of the arm 11. In this way, as the cutting edge 9 wears at the point of engagement with the web 1 it can be moved progressively upwards by rotating pinion 14 and so continuously presents a fresh part of the cutting edge 9 to the web. Rotation of the pinion 14 can be arranged by manual means or automatic means with a drive taken from the machine drive. When the transverse of the knife 8 is complete and the whole cutting edge 9 has been consumed, it can be removed from the machine and resharpened or discarded according to preference.

Referring now to FIGURES 3, 4 and 5, web slitting machine similar to that of FIGURE 1 is shown, as a fur-

ther embodiment of a slitting knife of the invention. In these figures those parts which are similar to those shown in FIGURES 1 and 2 are given like reference numerals.

In this embodiment the arrangement of the web 1 and its reel 2 and rewind reels 5 and 6 on the machine frame 4 is similar to that of FIGURE 1. The slitting knife however is in the form of a ribbon 15 of steel provided in a coil 16. The coil 16 is mounted on the top of an arm 17 which is pivotally mounted on the machine base 4 at a point 12 in a similar manner to the arm 11 in FIGURE 1. The knife ribbon 15 is drawn from the reel 16 and passes through the nip between a pair of small rollers 18 and 19 which are rotatably mounted on the arm 17. The roller 19 is carried by a shaft 20 which passes through the arm 17 and has a worm wheel 21 fixed thereon at the opposite end from the roller 19. The worm wheel 21 is arranged in mesh with a worm gear 22 which is rotatably mounted on the machine frame concentrically to the pivot point 12 of the arm 17. Thus it can be seen that if the worm 22 is caused to rotate, the knife ribbon 15 will be progressively drawn past its point of contact with the web 1 by the action of the rollers 18 and 19.

In order that the knife ribbon 15 is maintained with its cutting edge correctly aligned with the web, it is arranged to pass through a guide slot formed in the arm 17 which closely fits the knife ribbon 15 and affords the required support while allowing it to slide therethrough. The arm 17 is biased towards the web 1 by means of tension spring (not shown) in a similar manner to that for arm 11 of FIGURE 1.

Again the worm 22 can be arranged for manual or automatic rotation as by the motor 30 and a belt 32, with the result that the ribbon 15 is drawn past its point of contact with the web 1 and a fresh cutting edge thereon is continuously presented to the web. When the entire knife ribbon has been consumed it is discarded and a fresh one fitted.

Thus it can be seen that either of these embodiments of the invention will provide means whereby a freshly sharpened cutting edge is continuously presented to the web to be slit and correct slitting of the web will be maintained despite wear caused to the cutting edge.

We claim:

1. An apparatus for slitting flexible web material, comprising:
  - a framework;
  - a first spindle rotatably mounted on said framework so as to support a roll of the web to be slit;
  - a second spindle rotatably mounted on said framework;

means for driving said second spindle to rewind said web from said roll onto said second spindle; and an elongated knife means pivotally mounted on said framework, said knife means having a cutting edge formed substantially along its entire length and arranged to bear on said web tangentially and thus slit said web as it curves over said second spindle during rewinding, said knife means comprising:

- an arm pivotally mounted on said framework adjacent said second spindle;
- a knife in the form of a coil of steel knife strip having a cutting edge along its length carried on said arm; a guide slot provided along said arm to receive, guide and support said knife strip drawn from said coil so as to present said cutting edge to said web; and means to draw said knife strip through said guide slot during operation of the apparatus to continually present a fresh cutting edge to said web.

2. An apparatus as claimed in claim 1, wherein said knife strip draw means includes a pair of rollers rotatably mounted on said arm in such position that said knife strip may pass through a nip between them on leaving said guide slot, and one of said rollers being arranged to be driven so as to draw said knife strip from said coil.

3. An apparatus as claimed in claim 2, wherein said one of said rollers is mounted on a roller shaft which is rotatably carried on said arm, a worm wheel mounted on said roller shaft, and a worm gear drivably mounted on said framework concentrically with the pivot point of said arm and in engagement with said worm wheel whereby rotation of said worm gear draws said knife strip through said guide slot.

4. An apparatus as claimed in claim 3, wherein said worm gear is driven from said means for driving said second spindle.

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WILLIAM S. BURDEN, *Primary Examiner.*

U.S. Cl. X.R.

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