# United States Patent [19]

**Deppe et al.**

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[54] **THREAD CUTTERS**


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[73] Assignee: **APAG Apparatebau AG**, Goldach, Switzerland



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[30] **Foreign Application Priority Data**

Aug. 14, 1973 Switzerland ..... 11672/73

[52] **U.S. Cl.** ..... **83/567**; 83/382; 83/387; 83/586; 83/636

[51] **Int. Cl.** ..... **B26d 5/08**; B26d 7/02

[58] **Field of Search** ..... 83/382, 387, 389, 566, 83/567, 568, 569, 563, 575, 582, 586, 636



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[57] **ABSTRACT**

A thread cutter for automatically severing filaments, particularly for use on texturing machines, comprises a housing in which a filament travels with some clearance past a stationary pinching device and a stationary knife. Operation of an electromagnet releases a carriage, carrying both a second pinching device and a second knife, to the action of a spring so that the filament is pinched between the two pinching devices while being kept free of the knife edges. Continued movement of the carriage results in the filament being cut between the knives and one of the filament ends being clamped between abutment faces on the pinching devices. Projections are provided on the moving pinching device for limiting the lateral movement of the thread during the pinching and cutting. The stationary knife edge is curved and the edge of the moving knife, which is spring pressed on to the stationary knife, is straight, the arrangement being such that the knife edges makes instananeous contact at a single point which travels along the knife edges as the carriage moves from its initial to its final position.


**10 Claims, 10 Drawing Figures**

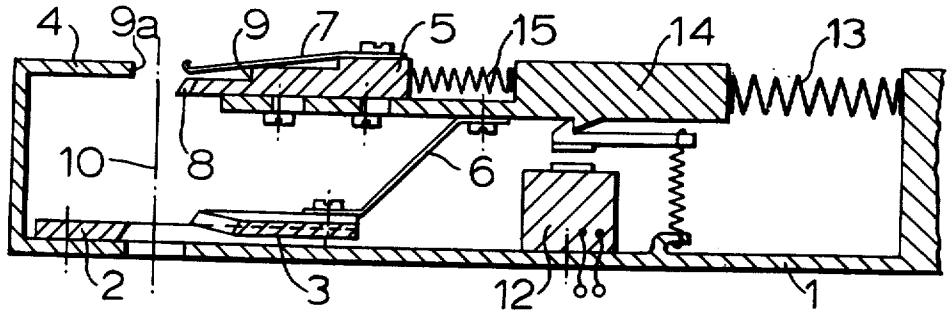


FIG. 1a

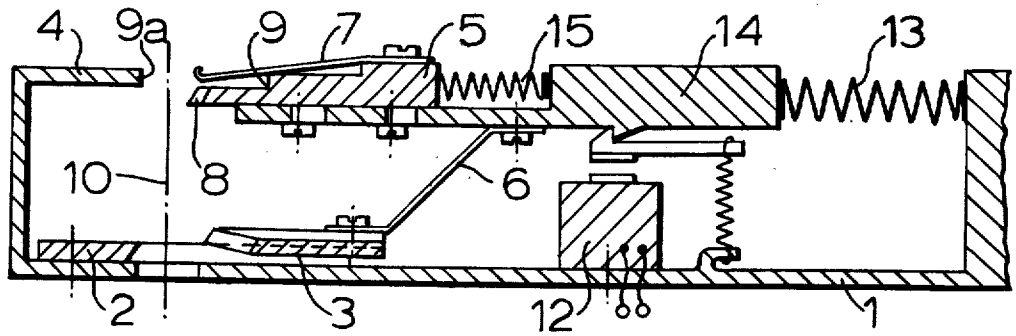



FIG. 1b

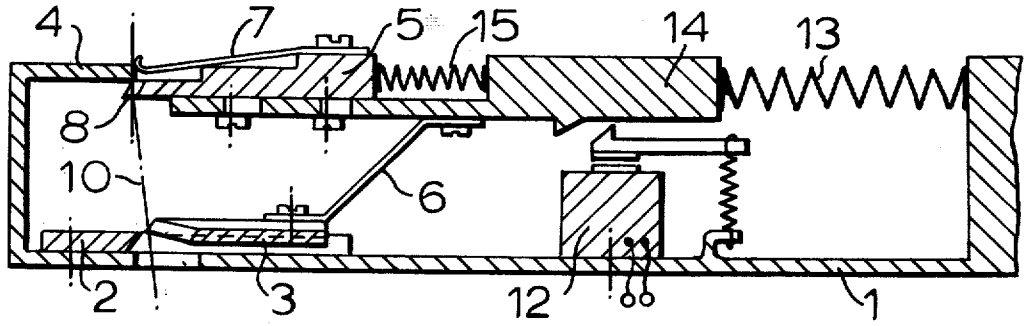



FIG. 1c

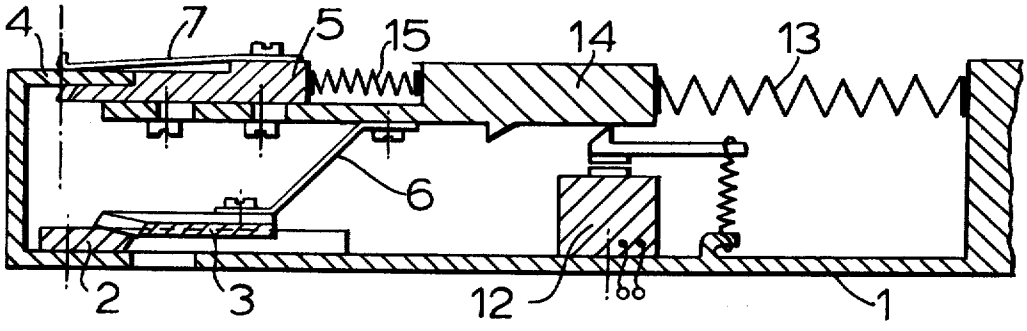



FIG. 2

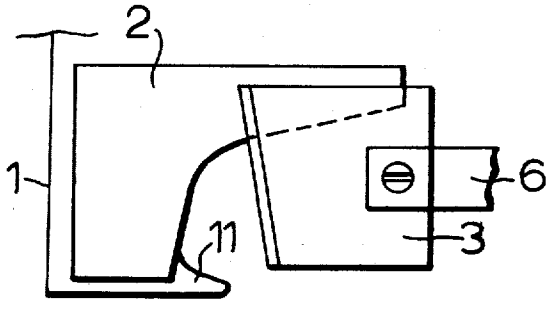


FIG.3

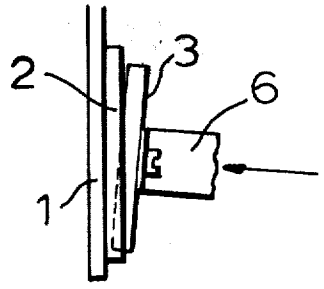



FIG.4

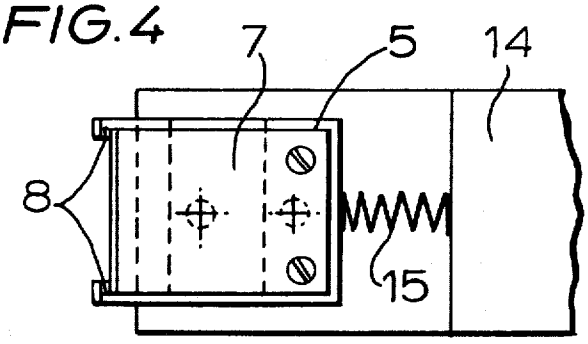



FIG.5

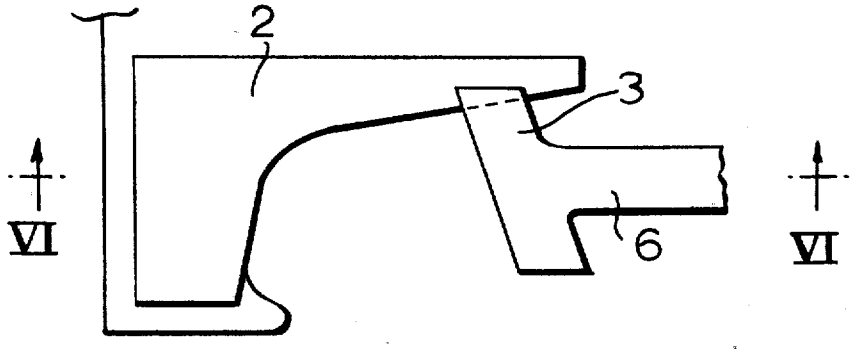


FIG.6

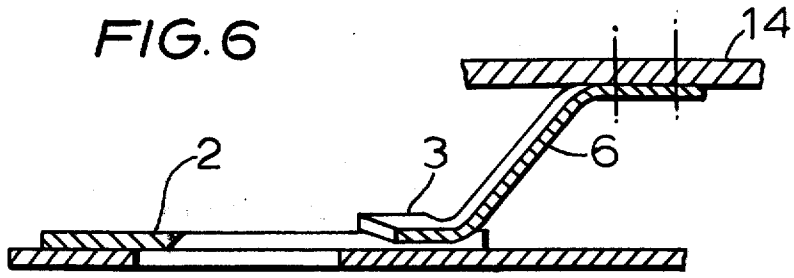



FIG.7

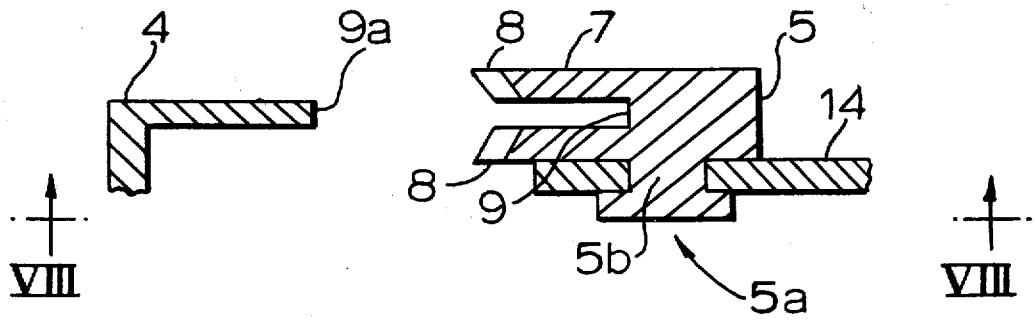
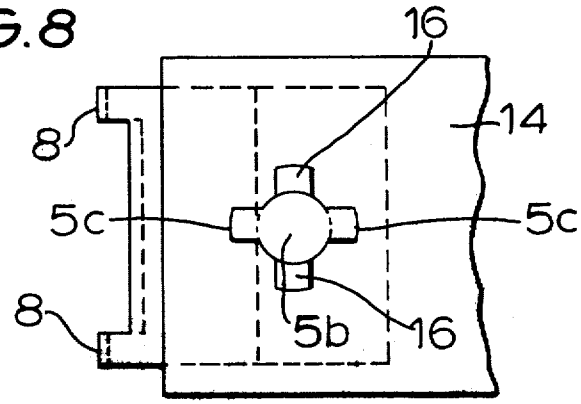



FIG.8



# THREAD CUTTERS

## FIELD OF THE INVENTION

This invention relates to a thread cutter for automatically severing filaments (e.g. thread or threadlike materials or yarns) particularly for use on texturing machines. The thread cutter comprises two knives movable with respect to one another, as well as a filament pinching or gripping device for holding one of the severed filament ends.

## DESCRIPTION OF THE PRIOR ART

Thread cutters of this kind are known and frequently used in various forms. An essential condition of their operation is the safe and rapid cutting of the filament. Furthermore, a cut end of the filament must be fixed within the filament cutter to facilitate its later handling. Thus, a filament cutter is known which, comprises a razor blade as cutting device. The disadvantage of this arrangement consists in the rapid wear after only a few cutting operations of the knife since, during and especially before the proper cutting process, the filament runs past the thin cutting edge of the blade at high speed. Furthermore, safe retention of the filament is not assured since cutting may occur before the filament end is secured.

Other known thread cutters shear the filament running through an eye open on one side of a fixed knife by means of a movable knife. Whereas longer life duration of the knife is obtained thereby, safe cutting of the filament in the first cutting operation is not assured since the knife surfaces are in contact with each other at two points and the slightest unevenness between the knives provides a slit in which the filament may become pinched instead of being cut. Furthermore, the cut is always effected at the same location on the knives since the filament is first pressed against the edge of the eye before being cut and this causes additional wear and deterioration of the cutting properties.

## SUMMARY OF THE INVENTION

It is the purpose of the present invention to avoid the disadvantages of the known devices and especially to provide a thread cutter of the type described above which assures safe pinching and cutting combined with long life of the cutting elements.

According to the present invention, this problem is resolved by the combination of the following features:

a. a movable pinching device and one of two knives are mechanically coupled to a carriage and movable together with the latter to effect cutting;

b. the movable pinching device is so arranged, in the direction of movement thereof in front of the knife that the filament is at first kept free of the knife edge and pinched and only thereafter reached and cut by the knife;

c. a guiding device for laterally guiding the filament during the whole cutting process is arranged on the movable pinching device or on a stationary pinching device with which it co-operates in retaining the filament end;

d. the cutting edges of the knives are so bevelled and/or curved that, during the whole cutting process, there is only one contact point between the two knives.

By combination of these features, temporary retention of the filament is achieved prior to the beginning of the cutting procedure, and furthermore, the filament



is kept away from the knife until the cutting step begins. Furthermore, the shape of the cutting edges of the knives provides safe cutting of the filament at the first cut since there is only one contact point between the two knives wherefore the filament cannot become pinched between the knives.

Furthermore, the filament is guided laterally by means of a guiding device which is arranged one of the pinching devices so that the filament cannot escape. In a further embodiment of the invention, one knife edge, preferably the edge of the movable knife, may be straight, and the other one curved, preferably approximately in the shape of an L. It is particularly advantageous if the two contacting knife surfaces are slightly inclined towards each other.

This permits with rectilinear knife movement only single point contact to be made between the two knife edges the position of the point depending on the instantaneous position of the two knives with respect to one another so that, during movement of the movable knife from the initial stationary inoperative position to the final position, the contact point moves over the whole of the fixed and movable knife edges. This makes possible safe and at the same time low-wear cutting, and at the same time provides self-sharpening of the two knife edges to a certain extent.

The present invention may be realized advantageously if one knife, preferably the movable knife, is articulated on the carriage by a spring exerting a vertical component of force on the knife surface to exert pressure on the other knife. In one economical embodiment of the invention, the spring is a leaf spring shaped in one piece with the movable knife. The movable knife and the spring may consist of spring steel whereby sufficient elasticity of the spring and furthermore the required hardness of the movable knife can be achieved.

The guiding device may advantageously consist of at least two projections arranged on one of the pinching devices, preferably on the movable pinching device.

In a further embodiment, the pinching assembly may be realized advantageously if the movable pinching device comprises a pinching spring for temporarily retaining the filament, and for final pinching an abutment surface on this device abuts against the stationary pinching device. It is then advantageous if at least one of the pinching devices is resiliently biased and arranged on its respective holder to compensate during pinching for manufacturing tolerances and for filaments of different diameters being cut.

Advantageously, the movable pinching device, for compensating for manufacturing tolerances is arranged movably and/or rotatably on the carriage. Thereby, particularly manufacturing tolerances in the parallelism of the abutting elements may be compensated by slight rotation of the movable pinching element whereby effective final pinching of the filament between the abutment surfaces can be assured.

In a further embodiment of the invention, the pinching spring may be in one piece with the movable pinching device.

Additional lateral control of the thread may advantageously be achieved by means of at least one protruding element which may be arranged below or above one of the knives.

The filament cutter may be rendered active by means of a small electromagnet which is automatically actuated upon thread breakage to actuate a pivoted arma-

ture. Resetting into operative position may be effected by hand.

As can be seen, the inventive contents and technical progress of the subject of this specification are assured by the new individual features as well as especially by combinations and sub-combinations of all features used.

## DESCRIPTION OF THE DRAWINGS

In order that the invention may be clearly understood and readily carried into effect, thread cutters in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGS. 1*a*, 1*b*, 1*c* show a longitudinal cross-section through a filament cutter when in its inoperative condition and when in two phases of its cutting action;

FIG. 2 is a plan of a cutting assembly in the cutter of FIGS. 1*a*, 1*b*, 1*c*;

FIG. 3 is a lateral elevation of the cutting assembly of FIG. 2;

FIG. 4 is a plan of a movable pinching device in the filament cutter of FIGS. 1*a*, 1*b*, 1*c*;

FIG. 5 is a plan of a modification of the assembly of FIG. 2;

FIG. 6 is a cross-section along line VI — VI in FIG. 5;

FIG. 7 is a longitudinal section through a modification of pinching devices shown in FIGS. 1*a*, 1*b*, 1*c*, and

FIG. 8 is a plan as viewed from below on line VIII — VIII of a movable pinching device shown in FIG. 7.

FIGS. 1*a*, 1*b*, 1*c* show a filament cutter comprising a housing **1**, a knife **2** fixed thereon, a movable knife **3** which is articulated on a carriage **14** by means of a leaf spring **6**, a stationary pinching member **4** with an abutment face **9***a*, and a movable pinching member **5** with pinching a spring **7**, the pinching member **5** being biased by means of a spring **15**, and having projections **8** and an abutment face **9**, and the cutter further comprising an electromagnet **12** with a pivoted armture which serves to control the carriage **14** which is biased by a spring **13**.

In the inoperative position of the filament cutter shown in FIG. 1*a*, the filament **10** can run unimpededly through the filament cutter since the carriage **14** with the pinching member **5** and cutting knife **3** is held stationary against the action of the spring **13**. Upon filament breakage the magnet **12** is energized to withdraw the armature and release the carriage **14** to the action of the spring **13**. From 1*b* which shows the pinching phase the arrangement of the movable member **5** of the pinching device a head of the movable knife **3** in direction of movement can be recognized distinctly. Thus, in the pinching phase, the filament is first temporarily pinched between the movable pinching member **5**, the stationary pinching member **4** and the pinching spring **7** and is consequently kept away from the movable knife **3**. The immediately following pinching and cutting phase shown in FIG. 1*c* results in the cutting action and a more definite pinching action. During this phase, the filament **10** which is now immobilized is cut at the contact point between the stationary knife **2** and the movable knife **3** and the remaining portion is securely pinched between the abutment faces **9**, **9***a*.

As shown in the plan of FIG. **2**, the movable knife **3** is provided with a straight edge extending obliquely with respect to the direction of movement of the carriage **14**. An approximately L-shaped curved edge is provided on the stationary knife **2**. The pressure of the spring **6** provides a component of force at a right angle with respect to the movable knife surface. This arrangement of knives means that, upon movement of the movable knife **3** from inoperative position to the terminal position, the contact point of each knife edge moves over the whole length of the knife edge. Furthermore, a projection **11** is arranged below and to one side of the stationary knife **2** as an additional lateral guiding element for the filament. The side view of the cutting assembly shown in FIG. **3** indicates that the two knives **2**, **3** are inclined with respect to one another. The projection **11** may alternatively be mounted above the movable knife **3**.

FIG. **4** shows the movable member **5** of the movable pinching device, and the projections **8** which are necessary for the lateral guiding of the filament, ie. laterally limiting the sideways movement of the filament.

In the modification of FIGS. **5** and **6**, the cutting assembly consists of an arrangement in which the movable knife **3** is shaped in one piece on the leaf spring **6**, and the latter is resiliently articulated to the carriage **14** in order to exert pressure on the stationary knife **2**.

In the modified pinching devices of FIG. **7**, the movable device comprises two resilient pinching members or pinching springs **7** each of which comprises two projections **8**. Between the pinching members or pinching springs, there is provided an abutment face **9** which cooperates with a complementary abutment face **9***a* on the stationary pinching member **4**.

The movable pinching member **5** is mounted on the carriage **14** by means of a fixing device **5***a* consisting of a cylindrical base part **5***b* and two projections **5***c* disposed thereon in diametral opposition.

The carriage **14** is formed with an opening **16** complementary with the fixing device **5***a* so that, to mount the movable member **5**, the fixing device **5***a* is introduced into the opening and thereafter locked to the carriage **14** by rotation of the member **5** by 90°. Thus, it is possible visually to mount the movable member **5** without shifting it in the longitudinal direction of movement of the carriage. The member **5** may be turned slightly on the carriage **14** to compensate for manufacturing tolerances of the abutment faces **9**, **9***a*.

By choosing suitable dimensions for the pinching members or pinching springs, the desired elasticity of these may be achieved so that prior to cutting the filament temporarily is pinched between the pinching members or pinching springs and the abutment face **9***a* of the stationary pinching device **4**. The spring **15** is provided to compensate for differences in the diameters of the yarns or filaments being gripped between the abutment faces **9**, **9***a*.

We claim:

**1**. A thread cutter for automatically severing filaments, particularly for use on texturing machines, including a housing, a first cutting knife having a cutting edge and a first pinching device having an abutment surface mounted in spaced relationship on said housing, said housing, said first cutting knife and said first pinching device being arranged for a filament to travel past said cutting edge and said abutment surface, a carriage mounted for to-and-fro movement with respect to said first cutting knife and said first pinching device on the side of said filament remote therefrom, a second cutting knife having a cutting edge and a second pinch-

ing device having an abutment surface both mechanically coupled with said carriage and movable together with said carriage to effect cutting, said second cutting knife and said second pinching device being positioned in the direction of movement of said carriage with said second pinching device leading said second knife, whereby on movement of said carriage a predetermined distance from an initial position the filament is first pinched and kept free of said knife edges by said pinching devices and on further movement of said carriage the filament is cut by said knives and some portion of the filament is gripped by said abutment faces, and guiding means on one of said pinching devices for limiting the transverse movement of the filament throughout the cutting thereof, said cutting edges of said knives being formed so that throughout the cutting movement of said second knife there is only one contact point between said knives.

**2.** A thread cutter according to claim **1**, in which said knife edge of one of said knives is straight and said knife edge of the other of said knives is curved, and in which the movement of said movable knife is rectilinear.

**3.** A thread cutter according to claim **1**, including a spring interposed between said second knife and said carriage whereby said second knife is articulated to said carriage, said spring being operative to press a surface of said second knife against a surface of said first knife, the contacting surfaces of said knives being inclined to one another transversely to the direction of movement of said carriage.

**4.** A thread cutter according to claim **1**, in which said knife edge of said second knife is arranged obliquely with respect to the direction of movement of said carriage and in which said knife edge of said first knife is curved substantially in the shape of an L, said second knife being mounted at all times to overlap one limb of said substantially L shaped knife.

**5.** A thread cutter according to claim **1**, in which said guiding means comprise two projections respectively mounted on opposite sides of said second pinching device and projecting forwards therefrom towards said first pinching device.

**6.** A thread cutter according to claim **1**, in which said second pinching device includes a pinching spring mounted to pinch the filament against said first pinching device prior to the engagement of the filament between said two abutment faces.

**7.** A thread cutter according to claim **1**, in which one of said pinching devices is resiliently or rotatably mounted to yield when pinching a filament, thereby compensating for differences in filament diameters.

**8.** A thread cutter according to claim **4**, including a member provided with a projection, remote from said limb which said second knife overlaps, for preventing the filament from separating from the other limb of said substantially L shaped first knife prior to cutting.

**9.** A thread cutter according to claim **3**, in which said spring is a leaf spring formed in one piece with said second knife.

**10.** A thread cutter according to claim **6**, in which said pinching spring is formed in one piece with said second pinching device.

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