May 15, 1956 R. STEIGER ET AL 2,745,490

FILAMENT-STAPILIZING MACHINE, INCLUDING GRINDING RING

Filed Jan. 12, 1954 2 Sheets-Sheet 1

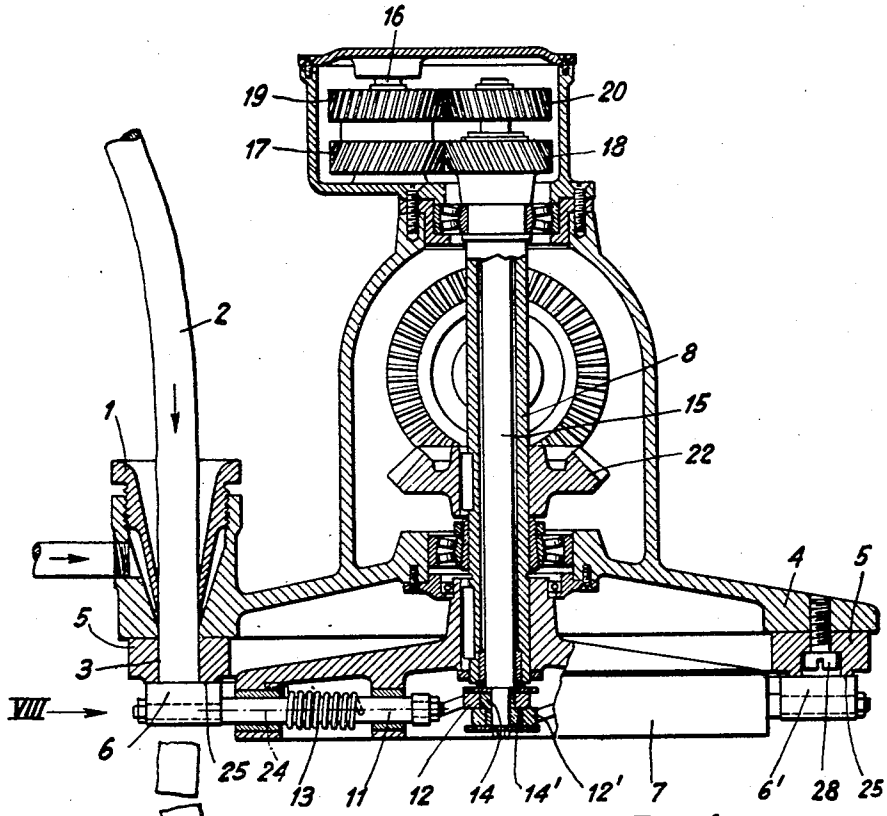


Fig. 1

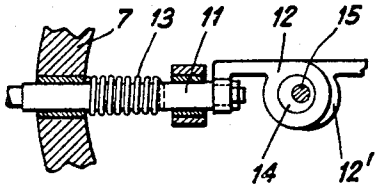


Fig. 2

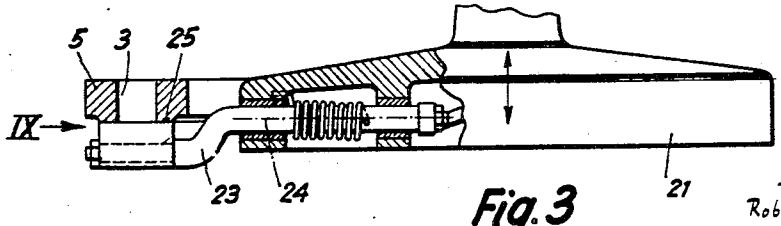


Fig. 3

INVENTOR:
Robert Steiger and
Fritz Lüthi
by [illegible]
Attorneys

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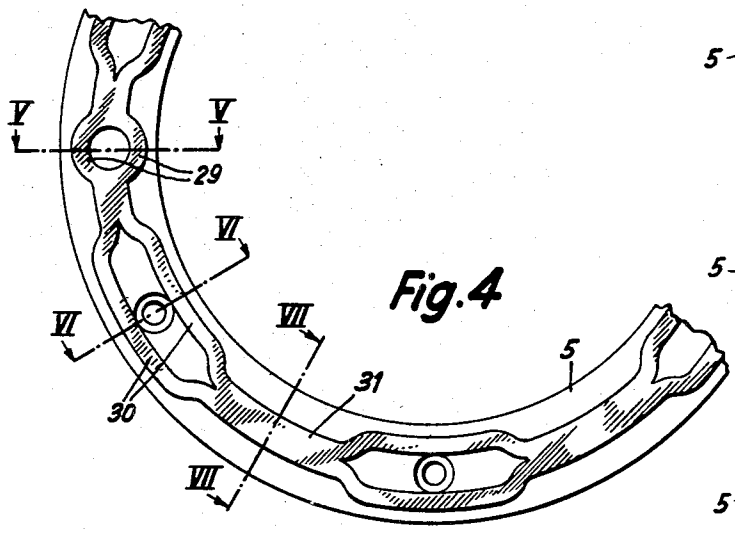


Fig. 4

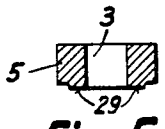


Fig. 5

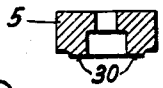


Fig. 6



Fig. 7

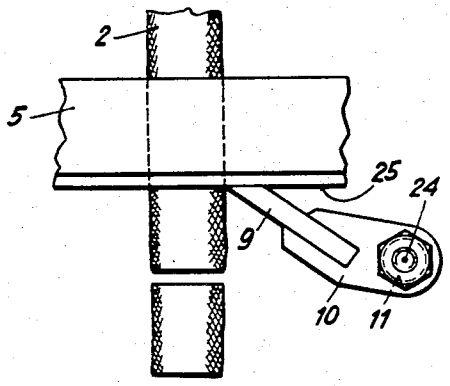


Fig. 8

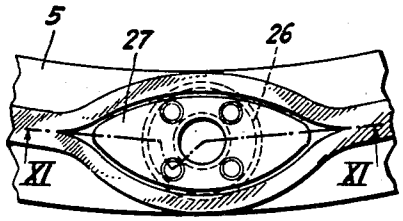


Fig. 10

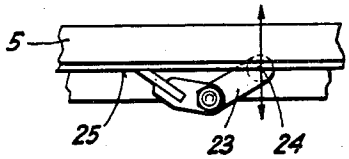


Fig. 9

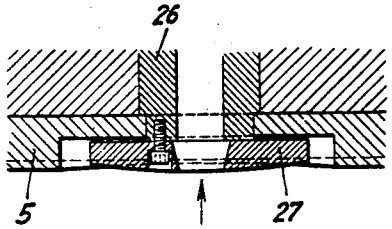


Fig. 11

INVENTOR:
Robert Steiger and
Fritz Lüthi
by [illegible]
Attorney

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FILAMENT-STAPILIZING MACHINE, INCLUDING GRINDING RING

Robert Steiger, Muri, near Bern, and Fritz Lüthi, Zollikofen, Switzerland, assignors to Ing. A. Maurer S. A., Bern, Switzerland

Application January 12, 1954, Serial No. 403,519

Claims priority, application Switzerland January 14, 1953

8 Claims. (Cl. 164—60)

The present invention relates to improvements in machines for cutting filament bunches, so-called stapilizing machines, and for grinding the knives of such machines.

In known machines of this kind, the knives have to be reground after comparatively short periods, lest threads of excessive length be produced, often or mostly caused by knives which have not been ground sharp or uniformly sharp. The machine has to be stopped for regrinding or, at any rate, for exchanging the knives, whereby the production costs are raised.

The German Patent No. 674,105 discloses a filament-stapilizing machine with rotary knives which are ground on a grinding ring during operation of the machine, between the single cuts of said knives.

This machine has the disadvantage that small grooves are formed in the grinding ring and in the knives after a short period, because every part of the knives is ground along the same path of the grinding ring. In order to avoid the formation of such grooves, the grinding ring may be moved in a direction extending in parallel with the plane of its grinding surface during the operation of the machine. The grinding ring could thus oscillate in either one direction or two directions perpendicular to each other. Such machines cannot be constructed easily since a substantial power would be required for oscillating a grinding ring of 10 to 100 pounds.

It is therefore the object of the invention to provide a filament-bunch cutting machine with at least one rotary knife, a grinding ring for grinding said knife during operation of the machine, and means for radially reciprocating said knife of said grinding ring.

It is another object of the invention to connect said knife to an eccenter fixed onto a shaft driven by the same means which drive the knife.

Still another object of the invention is to mount the knives on a carrier fixed onto a quill shaft in such a way that the knives may move radially with respect to said carrier. The shaft carrying said eccenter hereby extending throughout said quill shaft.

Still a further object of the invention is to arrange the grinding ring so that, on the one hand, its grinding width will be substantially the same for every angular position of the knives, and, on the other hand, the length of the grinding path during one rotation of the knives will be substantially the same for every point of the cutting edge of the knives.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

In order to understand the invention completely, reference is directed to the accompanying drawing in which one embodiment of the invention and modifications thereof are represented. In the drawings:

Fig. 1 shows a filament-stapilizing machine, partly in section,

Fig. 2 is a detail of Fig. 1 in a top view,

Fig. 3 depicts a modified detail thereof,

Fig. 4 illustrates a portion of a grinding ring, as seen from below,

Figs. 5 to 7 are sections on the lines V—V, VI—VI and VII—VII respectively of Fig. 4,

Fig. 8 shows a detail of Fig. 1, as seen in direction of the arrow VIII, but on a larger scale,

Fig. 9 depicts schematically a detail of Fig. 3 as seen in the direction of the arrow IX,

Fig. 10 is a bottom view of the cutting nozzle or head, and

Fig. 11 is a section on the line XI—XI of Fig. 10.

The stapilizing machine shown in Figs. 1 to 7 comprises a supply nozzle or trumpet **1** to which are fed filament bunches **2** which have to be stapilized. The said bunches may be of any cross-sectional shape. A jet of water or air may serve as feeding means, as shown, or systems of conveying rollers or tapes may be provided for such purpose. The trumpet **1** leads to a cutting nozzle **3**; a grinding ring **5** is fixed to a housing **4** by means of screws **28**. The nozzle **3** opens in the grinding surface **25** of the ring **5**. Two cutting means **6** and **6'** are carried by a disc **7**, said disc serving as knife carrier and being fixed to a quill shaft **8**. The cutting means **6** comprises a hard-metal knife **9** which is inserted in an intermediate member **10** which in turn is secured to a rotatably mounted axle **11**. The latter is rotatably connected to an eccentric ring **12**, as shown in Fig. 2. A spring **13** is supported on the disc **7** and the axle **11** so as to press the knife against the grinding ring **5** or the cutting nozzle **3**.

The cutting means **6'** is formed similarly to the means **6**, and the corresponding parts have the same but apostrophied reference numbers. In the quill shaft **8** is disposed a shaft **15** to which is secured an eccentric disc **14**. A drive, not shown, through a bevel gear **22** drives the quill **8** which in turn drives the shaft **15** through the gear train **17** to **20**. The transmission ratios are chosen so that there is a slight difference in the number of revolutions, i. e. advantageously so that the shaft **15** rotates at a slightly lower speed than the quill shaft **8**, but in the same direction, for example so that the latter rotates at 1000 revolutions per minute and shaft **15** at 999 R. P. M. In such case, each cutting means is reciprocated once per minute. Any other practical ratio may be chosen of course.

The apparatus operates as follows:

The supply means advance the filament bunch **2**, and the drive unit (not shown) drives the quill shaft **8**. The shaft **15** is rotated through the gear train **17** to **20**, as described. The quill shaft **8** rotates the disc **7** and, thus, causes the cutting means **6**, **6'** to rotate. By varying the speed of the drive unit or the rate of feed, the desired cutting speed and length of cut may be set. The shaft **15** and the eccentric discs **14**, **14'** secured thereto cause the cutting means to reciprocate so that the latter are uniformly ground on the grinding ring. The surface of the latter has preferably the shape shown in Figs. 4 to 7.

The grinding surface portions **29** in Fig. 5, **30** in Fig. 6 and **31** in Fig. 7 are so chosen that the total width of the grinding surface of ring **5** is the same in every radial section of the ring, the resistance due to the grinding operation thus being constant.

The shape of the grinding surface shown in Fig. 4 is further so chosen that the length of the grinding path along a circle concentric to ring **5** is constant in order that every part of the cutting edges of the knives will be ground to the same extent. Thereby a uniform grinding action of each knife and a uniform wear of the grinding ring is obtained. The latter may be made of a material which is harder or softer than that of the knives to be ground. Such former material may be, for example, cast silicon or a plastic incorporating abrasive, such as

acid-proof plastic incorporating finely distributed diamond dust or silicon carbide.

The idea of the invention is, of course, also applicable to machines in which the knife carrier is so arranged as to be adjustable vertically.

Figs. 3 and 9 show a portion of such a filament-bunch cutting machine. The elevation of the disc **21** may be adjusted by means not shown, whereby the cranked axle **23** which is rotatable about the geometrical axis **24** of the cranked axle **23** and which carries at its end the cutting means **6** may be moved above or below the cutting plane **25**. As shown in Figs. 3 and 9, a torque arises when cutting a filament bunch (if the axis **24** is below the cutting plane **25**) so that the knife is pressed harder against the cutting nozzle than against the other parts and portions of the grinding ring. A small additional pressure may be desirable. In the case of thick filament bunches, however, such pressure becomes excessive so that the mechanism shown in Figs. 3 and 9 serves for adjusting such pressure to the magnitude desired.

The disc **7** shown is provided with two cutting means. Any desired number of knives may, of course, be provided, but they have to be symmetrically arranged. If one cutting means only is provided, a suitable counterweight has to be provided.

In the machine described above, a mere hole in the grinding ring **5** is used as cutting nozzle **3**. According to the material used, there may, however, be a risk that the rim of such nozzle will break away sooner or later which defect would give rise to a bad cutting action despite keenly ground knives. Such drawback may be obviated by shaping the cutting nozzle as shown in Figures 10 and 11 in which a plate **27** is fixed by screws to a tube **26**. The plate **27** is slightly curved externally whilst the grinding ring **5** at the respective point is recessed, so that the knife edge is always supported. When the grindstone is worn somewhat, the tube **26** has to be adjusted in such a manner that the rim of the cutting nozzle always is situated in the plane of the grinding ring. Such adjustment is effected by adjusting means (not shown).

What we claim is:

1. In a filament-bunch cutting machine, the combination of at least one rotary knife, a grinding ring having a flat face being in contact with said knife so as to grind the same during operation of the machine, and means for reciprocating said knife radially with respect to said flat face of said grinding ring.

2. In a filament-bunch cutting machine, the combination of at least one rotary knife, driving means for rotating said knife, a grinding ring having a flat face being in contact with said knife so as to grind the same during operation of the machine, and means operatively connected to said driving means for reciprocating said knife radially with respect to said flat face of said grinding ring.

3. In a filament-bunch cutting machine, the combination of at least one rotary knife, driving means for rotating said knife, a grinding ring having a flat face being in contact with said knife so as to grind the same during operation of the machine, a shaft driven for rotation by said driving means, and an eccenter fixed on said shaft and connected to said knife.

4. In a filament-bunch cutting machine, the construction of a driving quill shaft, a knife carrier fixed onto said quill shaft, at least one knife held by said carrier and so arranged as to be radially movable with respect thereto, a grinding ring coaxial to said quill shaft and having a flat face being in contact with said knife so as to grind the same during operation of the machine, a driven shaft extending throughout said driving quill shaft and operatively connected thereto, and an eccenter fixed on said driven shaft and connected to said knife for reciprocating said knife radially with respect to said flat face of said grinding ring.

5. The combination of claim 4, in which the driving and the driven shaft are operatively connected together by means of a gear train.

6. The combination of claim 5, in which said gear train is arranged so as to drive said driven shaft in the same direction as the driving shaft, but with a different speed.

7. The combination of claim 4, in which said knife is connected to said eccenter by means of an axle rotatably mounted on said eccenter, a coil spring urging thereby said knife into cutting and grinding position as well.

8. In a filament-bunch cutting machine, the combination of at least one rotary knife, a grinding ring having a flat face being in contact with said knife so as to grind the same during operation of the machine, said grinding ring being so arranged that on the one hand the grinding width of said ring is substantially the same for every angular position of said knife, and, on the other hand, the length of the grinding path during one rotation of the knife is substantially the same for every point of the cutting edge of said knife, and means for reciprocating said knife radially with respect to said flat face of said grinding ring.

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