Dec. 26, 1939. K. GRUNERT 2,184,452

MACHINE FOR CUTTING LENGTHS OF THREAD OR THE LIKE

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Fig. 1.

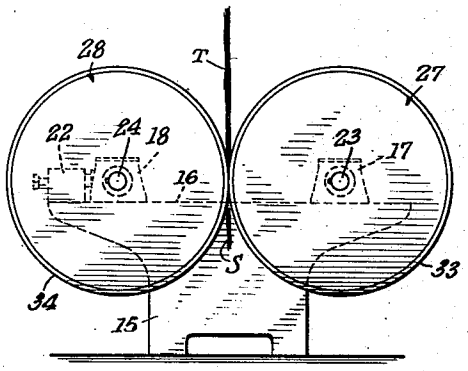


Fig. 2.

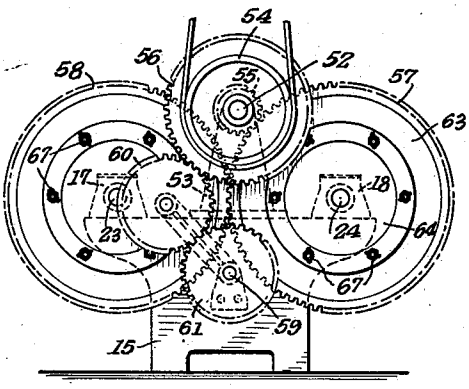


Fig. 3.

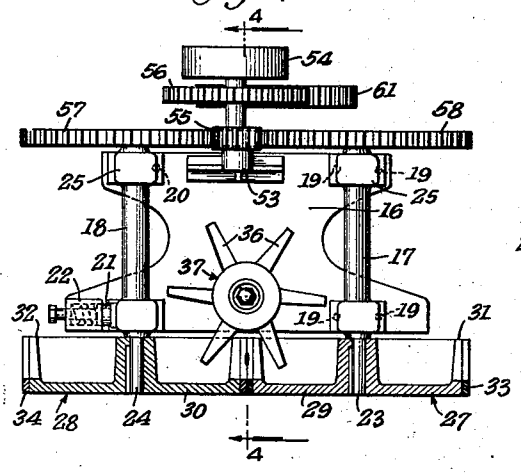
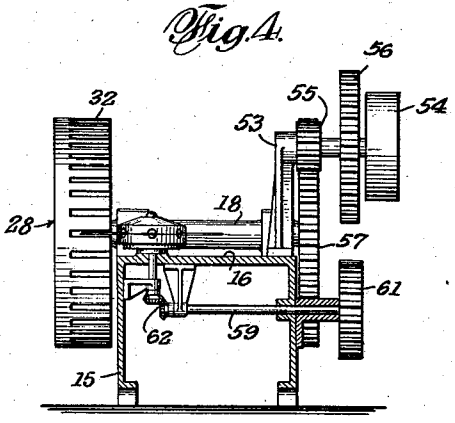


Fig. 4.



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Fig. 5.

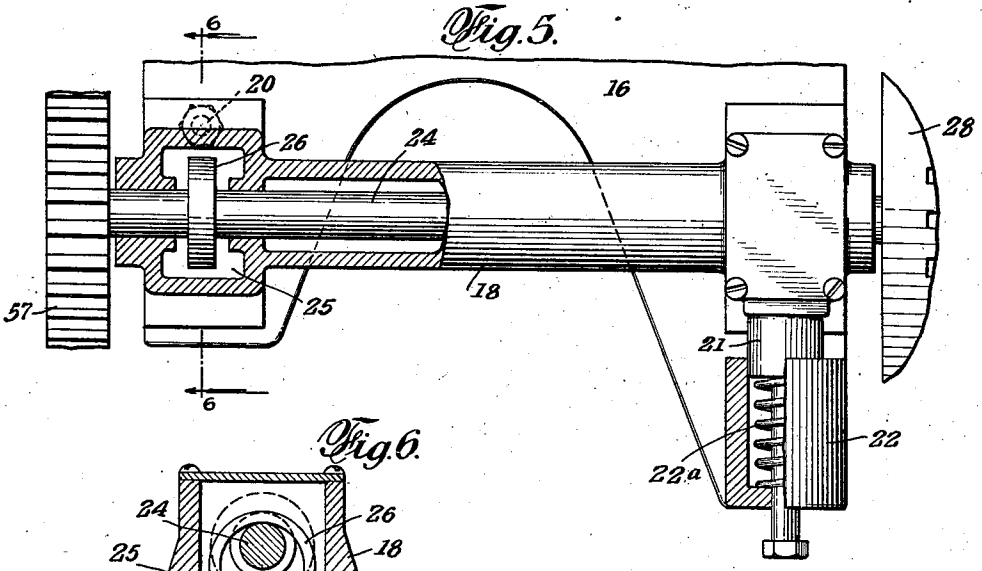


Fig. 6.

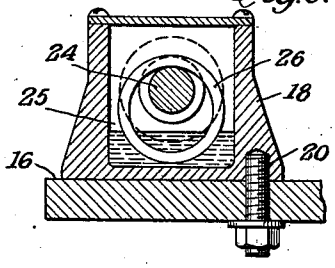


Fig. 7.

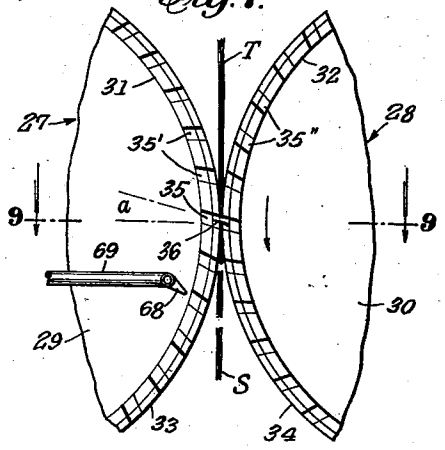


Fig. 8.

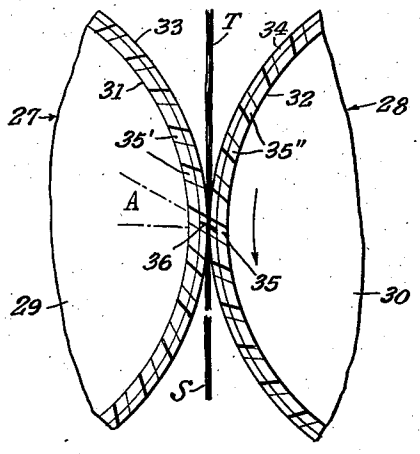
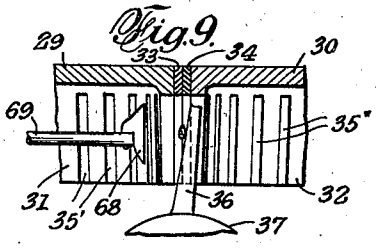


Fig. 9.



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Fig. 10.

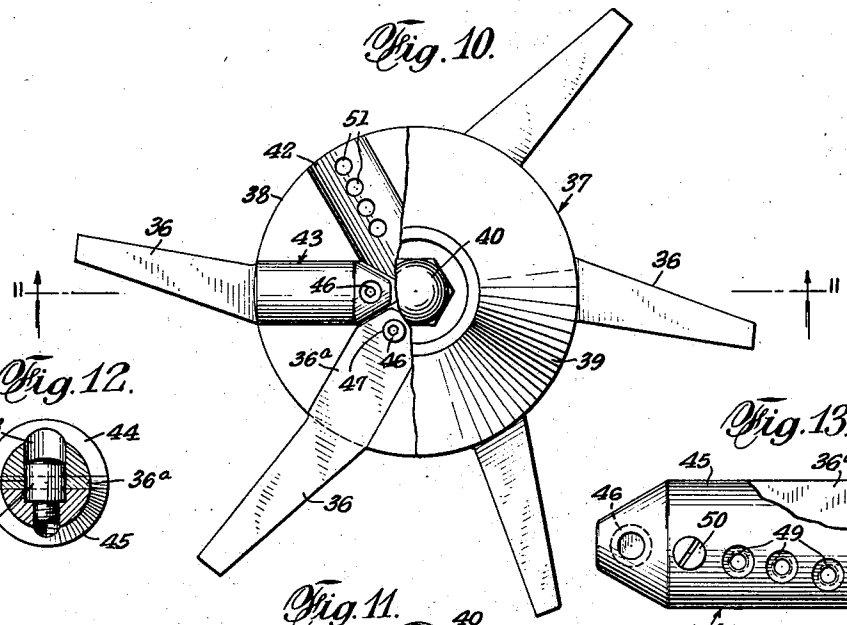


Fig. 12.

Fig. 13.

Fig. 11.

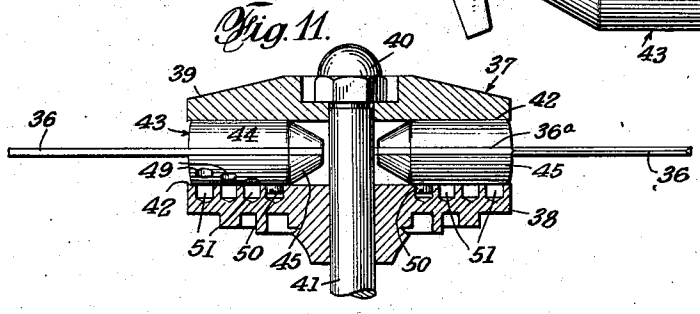


Fig. 14.

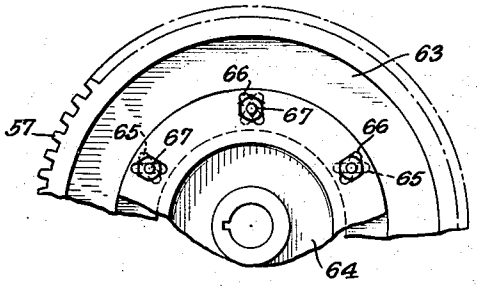
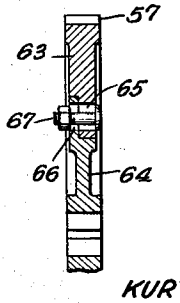


Fig. 15.



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UNITED STATES PATENT OFFICE

2,184,452

MACHINE FOR CUTTING LENGTHS OF THREAD OR THE LIKE

Kurt Grunert, Zittau, Germany

Application October 19, 1937, Serial No. 169,778

17 Claims. (Cl. 164—60)

This invention relates to a machine for cutting a continuously moving length of thread or the like into short lengths known as staples.

In the present disclosure, the term thread will be used to describe any thread-like length such as a fibrous bundle or the like, and the term staple will be employed to describe a short length thereof.

The present invention deals more specifically with a machine of improved construction and design for cutting staples.

This invention contemplates the provision of improved draw wheels or rollers for feeding thread or strands and which are each provided with a smooth compressible surface for efficient engagement of the thread between them.

Another feature of the invention resides in the provision of means for mounting at least one of the draw wheels or rollers in yielding relation to the other to compensate for inequalities in the thread such as abnormally thick portions or knots.

The invention also seeks to provide improved means for mounting the shafts of the draw wheels or rollers because of their high rate of rotational speed.

A further object of the invention is to provide draw rollers or wheels having relatively narrow transverse slots and providing thereby rigid feeding teeth thereon.

Another important feature of the invention is to provide an improved, novel, and simple cutter mounting turret incorporating means for angling the cutters in a horizontal plane for efficient cooperation with the draw wheels.

The invention also seeks to provide improved means for mounting the cutters in the turret.

Another feature of the invention resides in novel means for initially synchronizing the positions of the cutters in relation to the respective slots of the draw wheels, in the present instance entailing the adjustable mounting of certain of the gears employed in driving the draw wheels and the cutter turret.

The invention also contemplates the provision of simple and novel means for ridding the draw wheels of staples to obviate clogging.

With the foregoing and many other objects, features and advantages in mind the invention comprises the machine as illustrated in its preferred embodiment, in the accompanying drawings and described in the following detailed specification.

In the drawings:

Fig. 1 is a front view of a machine, in its present contemplated form, for cutting staples.

Fig. 2 is a rear view thereof.

Fig. 3 is a top plan view thereof.

Fig. 4 is a cross-sectional view as taken on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged detail plan view, partly in section, of a preferred mounting means for one of the draw wheels.

Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 5.

Figs. 7 and 8 are broken detail views of two preferred forms of draw wheels or rollers.

Fig. 9 is a cross-sectional view taken on the line 9—9 of Fig. 7.

Fig. 10 is an enlarged top plan view of the cutter turret, partly broken away.

Fig. 11 is a vertical sectional view on the line 11—11 of Fig. 10.

Fig. 12 is a sectional view through one of the cutter mounting means.

Fig. 13 is a bottom plan view, partly broken, of one of the cutter mountings.

Fig. 14 is a broken front elevation view of an adjustable gear wheel.

Fig. 15 is a sectional view thereof.

Referring to the drawings in greater detail which show one example of carrying out the invention, the machine frame 15 is formed with a table-like top 16 upon which are mounted, on each side of the longitudinal center, the shaft bearings 17 and 18.

The bearing 17, preferably formed of cast metal is fixedly secured to the frame top 16, as by means of bolts 19. The bearing 18, however, is mounted for horizontal pivotal movement upon a swing bolt 20 at the rear of the frame 15, the forward end thereof being urged towards the center line of the machine by a plunger 21 mounted in a housing 22 and urged in that direction by a coil spring 22^a as shown in Figs. 5 and 6.

Within the bearing 17, is mounted a shaft 23, and the bearing 18 similarly mounts the shaft 24.

It will become later apparent that these shafts revolve at a high rate of speed and in order to properly lubricate them, at each bearing at both ends, is formed a reservoir 25 for the storing of lubricant and provided with slinger rings 26 for disseminating the lubricant along the shafts.

At the forward end of the machine, the shafts 23 and 24 are extended to mount draw wheels or rollers 27 and 28 respectively. In the present form the wheels are formed with webs 29 and 30 and with relatively deep peripheral flange portions 31 and 32.

As herein contemplated, the flanges 31 and 32 are provided with the resilient coverings shown at 33 and 34 and since the plunger 21 urges the draw wheel 28 against the draw wheel 29, it is these coverings, which are in contact with each other under the urgency of the spring 22a. Fig. 3 best shows this relation.

Each of the draw wheels 27 and 28, is provided with slots 35', 35'' in the flange thereof, each slot being arranged tangent to a circle of a diameter smaller than the diameter of the wheel so that these slots are disposed at an angle, preferably other than a right angle, to the peripheral face of the wheel. As seen in Fig. 7 this angle designated *a* may be quite small whereas in the showing of Fig. 8, the angle A may be considerably larger.

In the above manner at the point of tangency between the draw wheels there is formed an angulated slot 35 comprising the slot 35' in the wheel 27 and the cooperating slot 35'' in the wheel 28.

As seen from Figs. 3, 4, 7, 8 and 9, a series of cutters 36 are arranged to pass through the slot formed at the tangency of the draw wheels and to sever a thread T engaged between the wheels and fed continuously downward thereby. Since the thread T is moved in a downward vertical direction and the cutters move in a horizontal path it is readily seen how this is accomplished. Because the motion of the draw wheels 27, 28 is continuous and not intermittent, the angulation of the slots 35 permits the cutters 36 to pass freely therethrough to sever the thread T to form the staples S. Thus the speed of the wheels 27 and 28 in relation to the cutters 36, determines the angle of the slots 35, and the number of cutters employed determines whether a cutter passes through each slot of the draw wheels, through alternate slots, or through each third slot.

From the above it is apparent that the length of the staples may be varied by changing the pitch between the slots in the draw wheels or by changing the number of cutters cooperating therewith, the slots 35 being suitably angled in relation with such changes.

The cutters 36 are preferably mounted in a turret 37 comprising the lower portion 38 and a cap portion 39 held together as by means of the nut 40 on the stub shaft 41. Each of the turret portions 38 and 39 is formed with a series of radially disposed semi-circular grooves which, when the turret is assembled, form seats 42 for the accommodation of cutter holders 43.

Each cutter holder comprises a pair of substantially semi-circular members 44 and 45 arranged on each side of the haft 36a of the cutter 36. The cutter is held from removal or from torsional movement with relation to the holder by a stud 46 carried by one of the holder members engaged in an opening 47 in the cutter haft 36a; the other holder member being formed with a hole 48 into which the stud protrudes (Fig. 12).

Since it is desired to angulate the cutters to suit the speed of the draw wheels and the angle of their slots, each cutter holder 43, in the portion 45 thereof, is provided with a plurality of recesses 49, preferably substantially helically arranged for the selective reception of an adjustable stud 50. The lower turret member 38 is formed with seats 51 into any of which the stud 50 may protrude. Thus, as shown in Fig. 11, the stud 50 is engaged in the innermost of the seats 51 and the knife is at substantially no angle. When the stud 50 is placed in the next recess 49 it will be engaged in the next adjacent seat 51 of the turret and the cutter will then be slightly angled. Hence, the greatest angle of the cutter may be obtained by placing the stud 50 in the outermost recess 49 and engaging said stud in the outermost seat 51.

It is understood that any number of cutters consistent with the requirements desired may be employed, mounted and arranged in any suitable manner on the turret. It is preferable that the cutters at the contiguous ends be tapered as clearly shown in the drawings, thereby enabling the cutters to be properly and fixedly mounted on the turret and further permitting a greater number to be used.

A preferred means for driving the draw wheels 27, 28 and the cutter turret 37 comprises a drive shaft 52 carried by a bracket 53 mounted on the machine frame 15, and having thereon a drive pulley 54 or the like and the gears 55 and 56. The gear 55 is arranged to mesh with a gear 57 on the shaft 24, which in turn is meshed with a gear 58 on the shaft 23. The gear 55 is quite smaller as compared to the gears 57 and 58 and thus their speed of rotation is quite slow in comparison with the speed of the drive shaft 52.

The gear 56 is arranged to drive the shaft 59 through the medium of the change gears 60 and 61 at a greater speed than the speed of the shafts 23 and 24, and the shaft 59 is geared to the turret spindle 41 by bevel gears 62 which may also be change gears. By means of the change gears above described, a six cutter-turret may be driven one revolution for the passage of its cutters through six adjacent draw wheel slots, through six alternate slots, or in any such arithmetical increment to obtain the desired length of staple cut by the machine.

In order to be able to properly synchronize the movement of the draw wheels with the movement of the cutters, each of the gears 57 and 58 may be adjustably mounted as shown in Figs. 14 and 15. To accomplish this purpose the gears are provided with rings 63 carried by discs 64 which are keyed to their respective shafts 23, 24. Each gear ring 63 is provided with a plurality of uniformly spaced angularly disposed closed slots 65 and the discs 64 are similarly provided with slots 66, oppositely and cross-wisely arranged thereto. A bolt 67 is passed through the associated slots 65 and 66 to secure releasably and fixedly the gear ring to the disc. This manner of securing will obviate any tendency of the gear rings to creep and fall out of adjustment since the forces which cause creeping are circumferential whereas the walls of the slots which take the thrust are more nearly radially disposed thereto. It is apparent that since locked up, the adjustment will be indisplacedly maintained.

As the staples S are formed, they may have a tendency to adhere to the peripheries of the draw wheels. Also the waste material resulting from the cutting operation has a like tendency of adherence. To obviate these tendencies, means may be provided to blow the staples and waste material clear of the wheels. One form of such means is shown in Fig. 7 wherein one or both wheels may be so freed by a nozzle 68 mounted for adjustment on a tube or pipe 69 through which air may be forced, or any other suitable fluid.

Since the gear 57 is mounted on the shaft 24, the said gear 57 becomes also pivotally mounted and will permit slight displacement thereof with respect to the meshing gear wheel 58 thereby

maintaining the gears 57 and 58 in meshing relation, irrespective of the tendency, to cause their binding which otherwise might occur due to the irregularities in the thread being fed between the wheels 27, 28.

Although the foregoing is quite detailed, it is apparent that skilled persons may practise the inventive concepts herein disclosed by varying the structure without departing from the spirit and scope of the invention as claimed. For this reason only the pertinent prior art should form the basis of interpretation of the scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a machine for cutting lengths of thread of fibrous material or the like, means for feeding said material, rotatably mounted cutters positioned in front of said feeding means, means for horizontal angular adjustment of said cutters, said feeding means including rotatable members, each member being provided with a resilient surface for engagement with said material and having a relatively deep flange portion provided with a plurality of transversely arranged slots, a slot of each portion being disposed for relative substantial alignment providing space through which one of said cutters may pass for the cutting operation.

2. In a machine for cutting lengths of thread of fibrous material or the like, means for feeding said material, rotatably mounted cutters, said cutters being angularly adjustable with respect to the horizontal plane of rotation thereof, said feeding means including rotatable members each member having a compressible surface for engagement with said material and having a relatively deep flange portion provided with a plurality of transversely arranged slots, a slot of each portion being disposed for relative substantial alignment providing space through which one of said cutters may pass for the cutting operation.

3. In a machine for cutting lengths of thread of fibrous material or the like, means for feeding said material, rotatably mounted cutters, means for adjusting said cutters in horizontal angular position, said feeding means having relatively deep flange portions provided with a resilient layer for frictionally engaging said material, each portion being provided with a plurality of transversely arranged slots, a slot of each portion being disposed for relative substantial alignment providing space through which one of said cutters may pass for the cutting operation.

4. In a machine for cutting lengths of thread of fibrous material or the like, means for feeding said material, rotatably mounted cutters adapted for horizontal angular adjustment, said feeding means having relatively deep flange portions, each of which being provided with a plurality of transverse angularly-disposed slots, a slot of each portion having an open end and being disposed for relative substantial alignment providing space through which one of said cutters may pass for the cutting operation.

5. In a machine for cutting lengths of thread of fibrous material or the like, means for continuously feeding said material, agularly adjustable movable cutters, said feeding means having relatively deep peripheral flange portions, said portions frictionally and resiliently engaging each other and being provided with a plurality of transversely arranged slots, the slots of one portion being adapted for respective alignment with the slots of another portion, providing thereby space through which said cutters may pass successively for the cutting operation.

6. In a machine for cutting lengths of thread of fibrous material or the like, means for continuously feeding said material, angularly adjustable cutters movable in a horizontal plane, said feeding means having relatively deep peripheral flange portions, each of said portions having a resilient outer lining and being provided with a plurality of transverse slots, the slots of one portion and the slots of another portion having open ends, the slots of one of said portions adapted for respective cooperation with the slots of another of said portions with their open ends adjacent providing space through which said cutters may pass for the cutting operation.

7. In a machine for cutting lengths of thread of fibrous material or the like, means for continuously feeding said material, movable cutters, and means for angularly adjusting said cutters in relation to said feeding means, said feeding means having relatively deep peripheral flange portions, each of said portions provided with a plurality of transverse angularly-disposed slots, the slots of one portion and the slots of another portion having open ends, the slots of one of said portions adapted for respective cooperation with the slots of another of said portions with their open ends adjacent, providing space through which said cutters may pass for the cutting operation.

8. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rotatable means for continuously feeding said material, movable cutters, and means for angularly and fixedly adjusting said cutters in relation to said rotatable means, said rotatable means having relatively deep cooperable peripheral flange portions, each of said portions provided with a plurality of transverse angularly-disposed slots, the slots of one portion and the slots of another portion having one of their respective ends open, the slots of one of said portions adapted for respective cooperation with the slots of another of said portions with their open ends adjacent, providing space through which said cutters may pass successively for the cutting operation.

9. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rotatable means for continuously feeding said material, movable cutters, and means for angularly and fixedly adjusting said cutters in relation to said rotatable means, said rotatable means having relatively deep cooperable peripheral flange portions, each of said portions provided with a plurality of transverse angularly-disposed slots, the slots of one portion and the slots of another portion having one of their respective ends open, the slots of one of said portions adapted for respective cooperation with the slots of another of said portions with their open ends adjacent, providing space through which said cutters may pass successively for the cutting operation, said rotatable means having relatively yieldingly disposed axes.

10. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rotatable means for continuously feeding said material movable cutters, and means for angularly and fixedly adjusting said cutters in relation to said rotatable means, said rotatable means having relatively deep cooperable peripheral flange portions, each of said portions provided with a plurality of transverse angularly-disposed slots, the slots of one portion and the slots of another portion having one of their respective ends open, the

slots of one of said portions adapted for respective cooperation with the slots of another of said portions with their open ends adjacent, providing space through which said cutters may pass successively for the cutting operation, said rotatable means and said portions being relatively yieldingly disposed.

11. In a machine for cutting lengths of thread of fibrous material or the like, a pair of cooperable, rotatable means for feeding said material, a cutter, a member carrying said cutter, and adjustable means for synchronizing the movements of said rotatable means and said member, said member rotatable substantially in a right angular plane with respect to said rotatable means, said rotatable means being yieldingly arranged and having peripheral deep flange portions adjacent each other provided with angularly-disposed slots, each of said slots having an open end, said slots being arranged with their open ends opposite each other, said member including means for adjustably and undisplacedly mounting said cutter thereon and in relation to said slots, said cutter passing through predetermined aligned slots of said rotatable means for the cutting operation.

12. In a machine for cutting lengths of thread of fibrous material or the like, a pair of cooperable, rotatable means for feeding said material, cutters, a member carrying said cutters, and circumferentially adjustable means for synchronizing the movements of said rotatable means and said member, said member rotatable substantially in a right angular plane with respect to said rotatable means, said rotatable means being yieldingly arranged and having peripheral deep flange portions adjacent each other provided with angularly-disposed slots, each of said slots having an open end, said slots being arranged with their open ends opposite each other, said member including means for adjustably and undisplacedly mounting said cutters thereon and in relation to said slots, said cutters passing through predetermined aligned slots of said rotatable means for the cutting operation.

13. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rollers, means for rotating said rollers in opposite directions for continuously feeding said material, a peripheral deep flange on each of said rollers, the flanges contacting each other, said flange having angularly-disposed slots, each slot provided with an open end, the open ends of the slots in one flange respectively facing the open ends of the slots in the other flange at the contacting surface of the flanges, a plurality of cutters having hafts, a rotatable member carrying said cutter hafts, and means for fixedly securing said hafts on said member, said means comprising semi-circular parts engaging the hafts and adjusting means on one of said parts for engagement with said member, a slot of one flange adapted for alignment with a slot of the other flange providing a passage through which said cutters may project successively for the cutting operation.

14. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rollers, means for rotating said rollers in opposite directions for continuously feeding said material, a peripheral deep flange on each of said rollers, the flanges contacting each other, said flange having angularly-disposed slots, each slot provided with an open end, the open ends of the slots in one flange respectively facing the open ends of the slots in the other flange at the contacting surface of the flanges, a plurality of cutters having hafts, a rotatable member carrying said cutter hafts, and means for fixedly securing said hafts on said member, said means comprising semi-circular parts engaging the hafts and adjusting means on one of said parts for engagement with said member, a slot of one flange adapted for alignment with a slot of the other flange providing a passage through which said cutters may project successively for the cutting operation, said rollers having relatively yieldingly disposed axes.

15. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rollers, means for rotating said rollers in opposite directions for continuously feeding said material, a peripheral deep flange on each of said rollers, the flanges contacting each other, said flange having angularly disposed slots, each slot provided with an open end, the open ends of the slots in one flange respectively facing the open ends of the slots in the other flange at the contacting surface of the flanges, a plurality of cutters having hafts, a rotatable member carrying said cutter hafts, and means for fixedly securing said hafts on said member, said means comprising semi-circular parts engaging the hafts and adjusting means on one of said parts for engagement with said member, a slot of one flange adapted for alignment with a slot of the other flange providing a passage through which said cutters may project successively for the cutting operation, said rollers and said flanges being relatively yieldingly disposed.

16. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rollers, means for rotating said rollers in opposite directions for continuously feeding said material, a peripheral deep flange on each of said rollers, the flanges contacting each other, said flange having angularly-disposed slots, each slot provided with an open end, the open ends of the slots in one flange respectively facing the open ends of the slots in the other flange at the contacting surface of the flanges, a plurality of cutters having hafts, a rotatable member carrying said cutter hafts, and means for fixedly securing said hafts on said member, said means comprising semi-circular parts engaging the hafts and adjusting means on one of said parts for engagement with said member, a slot of one flange adapted for alignment with a slot of the other flange providing a passage through which said cutters may project successively for the cutting operation, and means for clearing said slots of cut material resulting from the cutting operation.

17. In a machine for cutting lengths of thread of fibrous material or the like, a pair of rollers for feeding said material, a plurality of cutters, a rotatable member carrying said cutters, and driving means for rotating said rollers and said member, said means including adjustable means for synchronizing the movements of said rollers and said member, each of said rollers having a peripheral deep flange, the flanges contacting each other, said flange having angularly-disposed slots, each slot provided with an open end, the open ends of the slots in one flange respectively facing the open ends of the slots in the other flange at the contacting surface of said flanges, a slot of one flange adapted for alignment with a slot of the other flange providing a passage through which said cutters may project successively for the cutting operation.

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