United States Patent [19]

Fleissner

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[45] **Apr. 2, 1974**

[54] **DEVICE FOR CRIMPING GROUPS OF SYNTHETIC FILAMENTS**

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[73] Assignee: **Vepa AG**, Basel/Schweiz, Switzerland

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[21] Appl. No.: **168,825**

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Aug. 10, 1970	Germany	2039621
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Dec. 21, 1970	Germany	2062876
Dec. 21, 1970	Germany	2062878
Dec. 21, 1970	Germany	2062877
Apr. 8, 1971	Germany	2117393
Apr. 10, 1971	Germany	2117725
Apr. 20, 1971	Germany	2119002

[52] **U.S. Cl.** **28/1.6**

[51] **Int. Cl.** **D02g 1/12**

[58] **Field of Search** 28/1.6

[56] **References Cited**

UNITED STATES PATENTS

3,639,955 2/1972 Fleissner et al. 28/1.6

Primary Examiner—Louis K. Rimrodt

Attorney, Agent, or Firm—Craig and Antonelli

[57] **ABSTRACT**

A device for crimping textile materials which comprises a pair of driven rollers in contact with each other and operatively associated with a stuffer box, said box having two plates forming walls of a compression zone or compartment therebetween, one of said rollers and one of said plates being operatively connected to each other to form a unitary construction so that the volume of the stuffer box is automatically increased when the distance between the rollers is increased.

33 Claims, 23 Drawing Figures

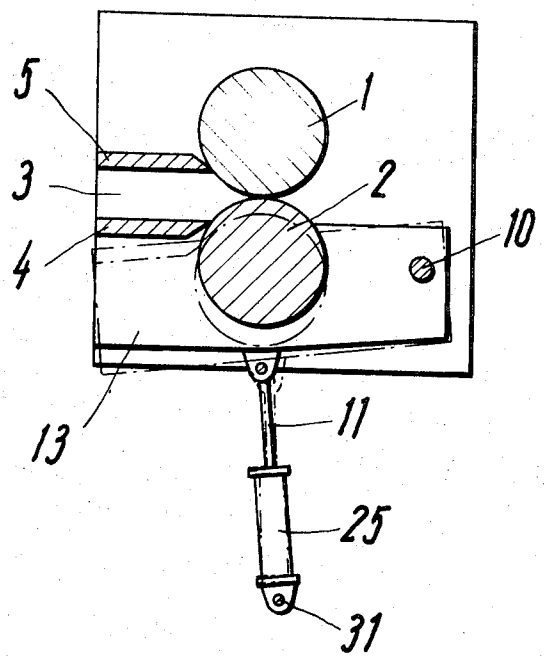

Fig. 1

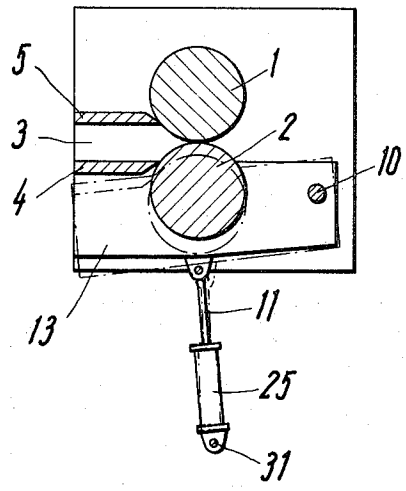

Fig. 2

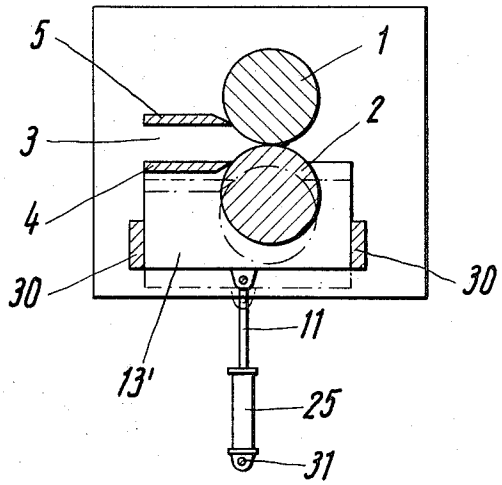

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Fig.3

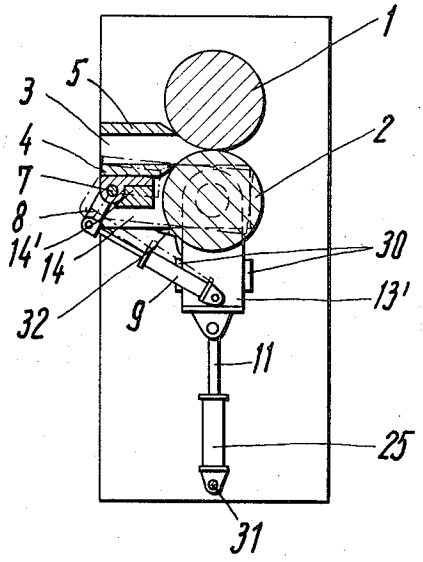

Fig.4

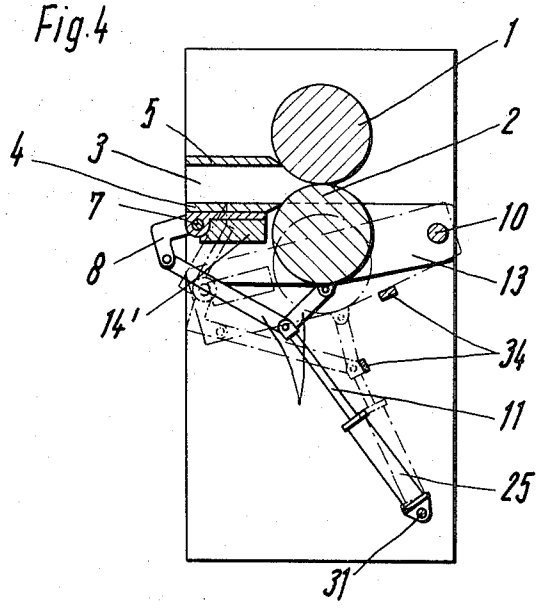

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Fig. 5

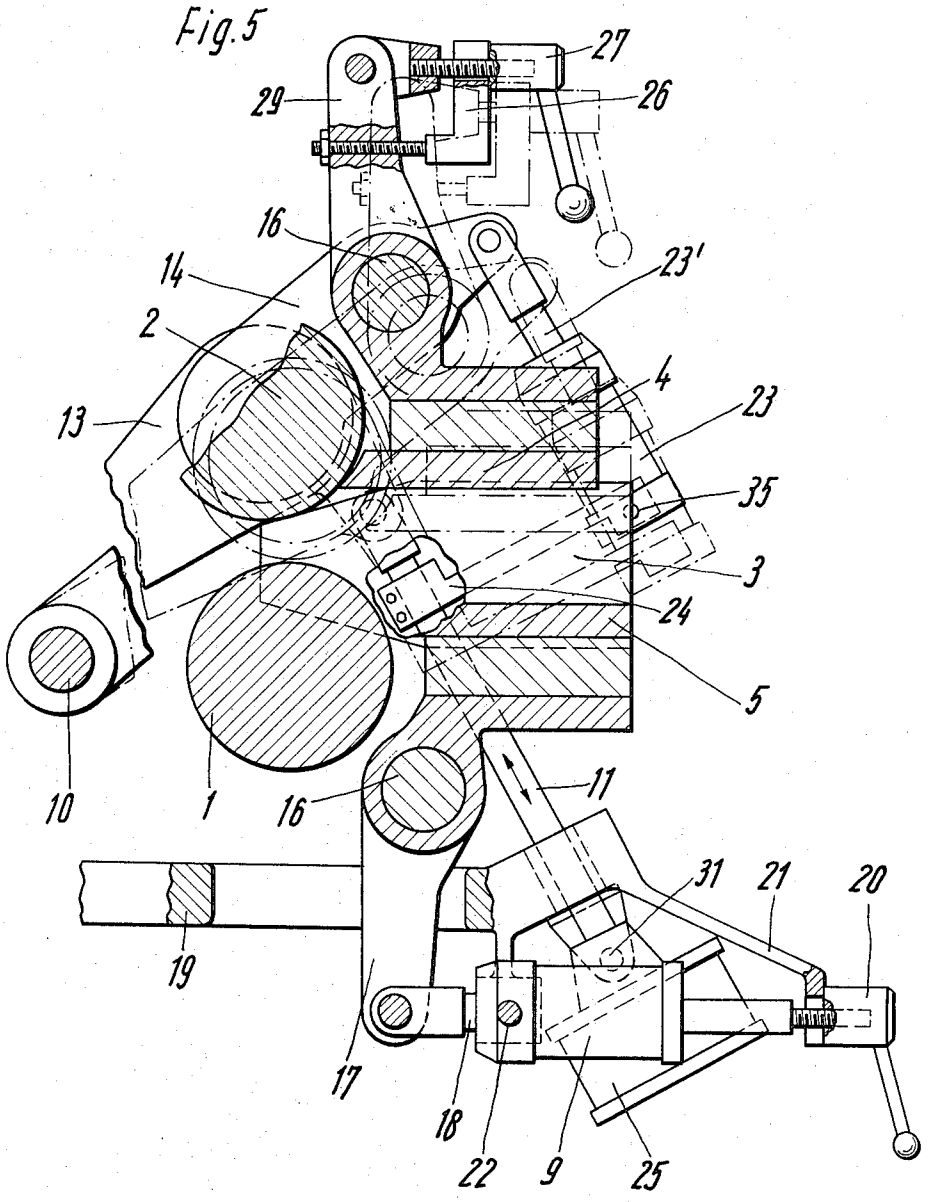

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Fig. 6

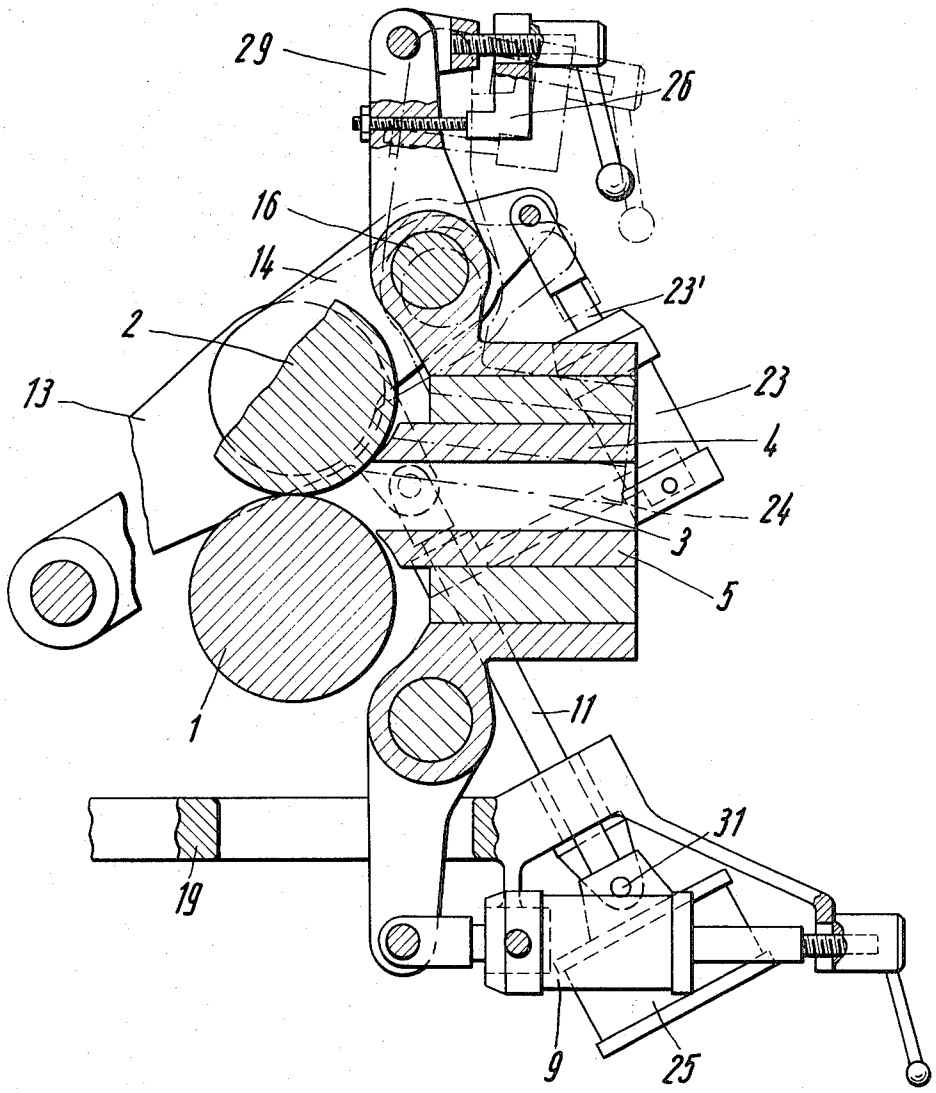

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Fig. 7

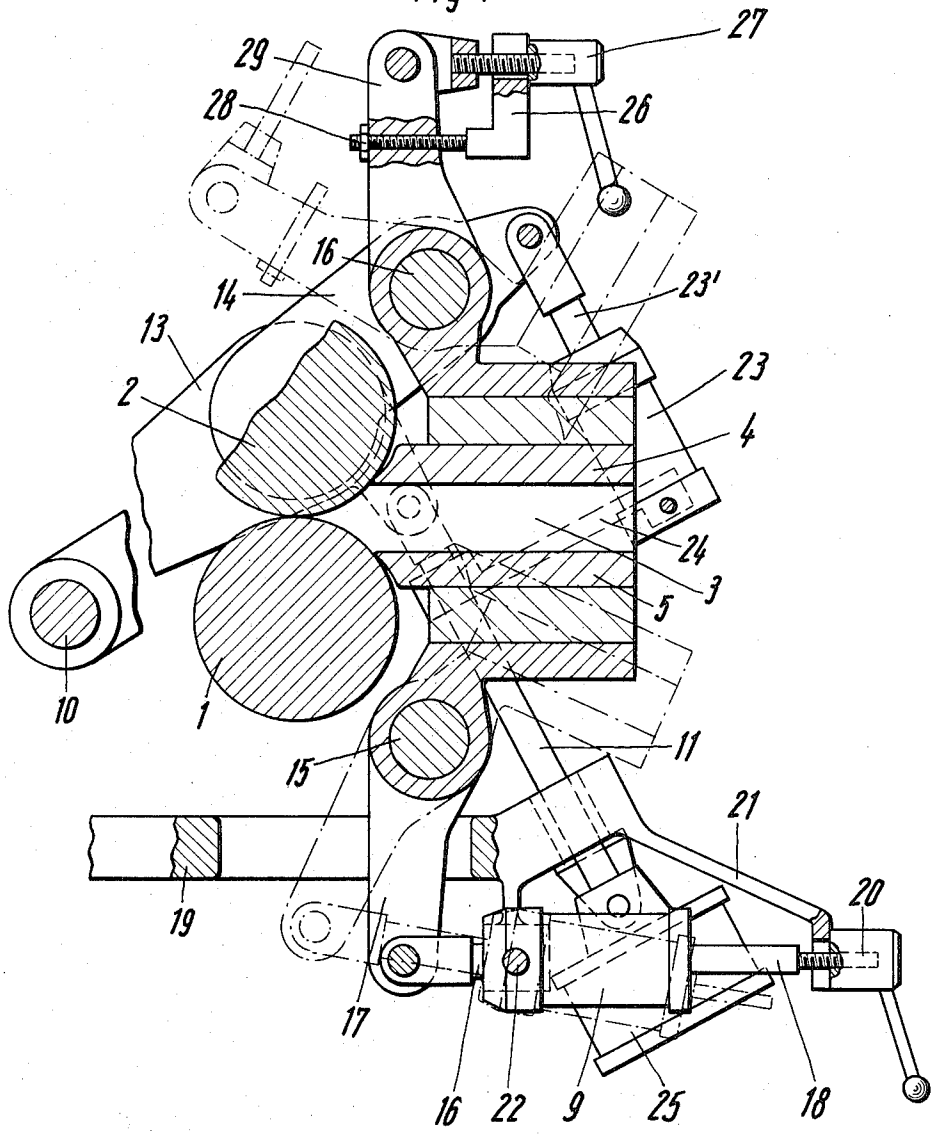

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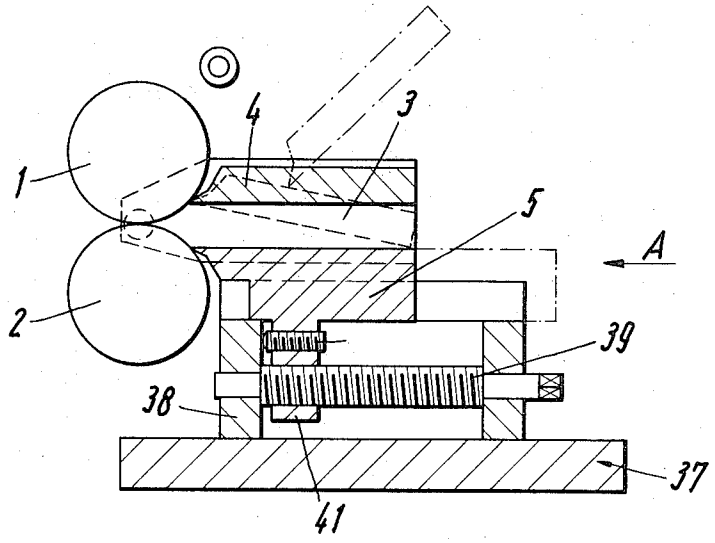
Fig. 8



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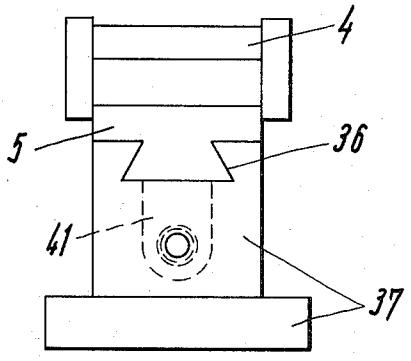

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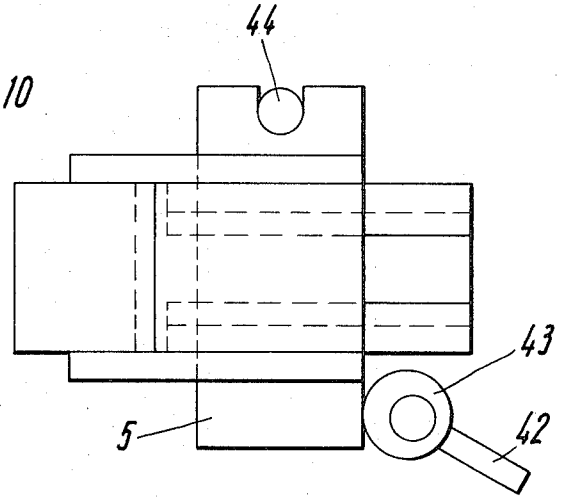

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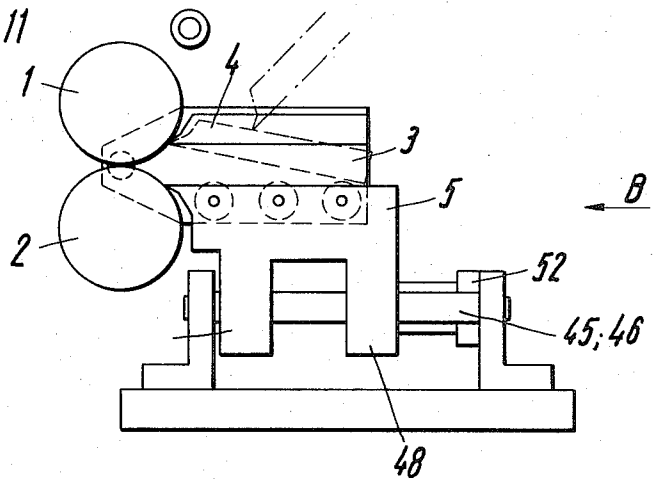
Fig. 11



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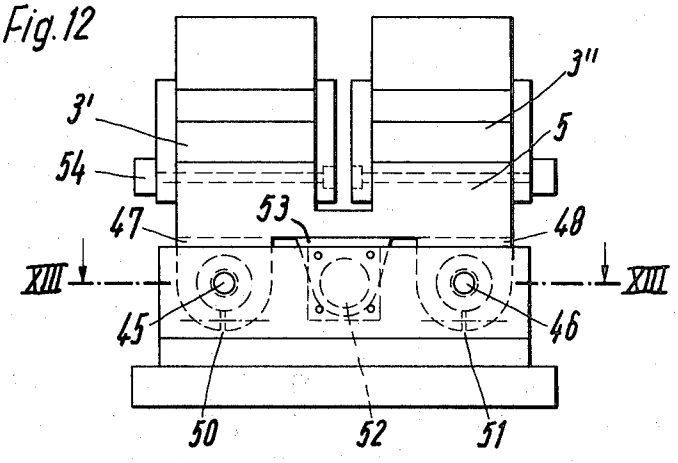

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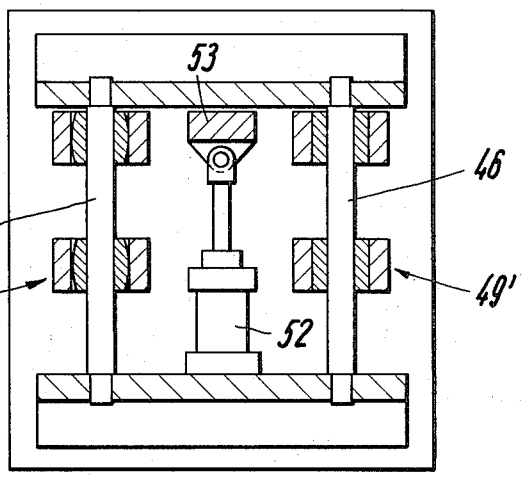

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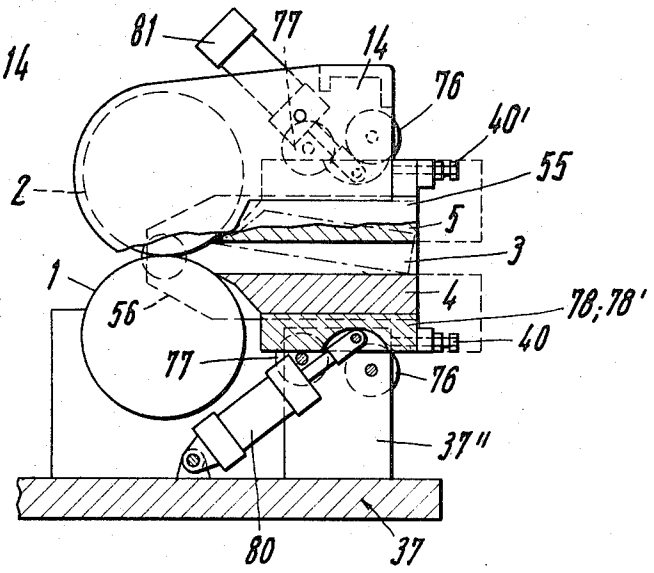
Fig. 14



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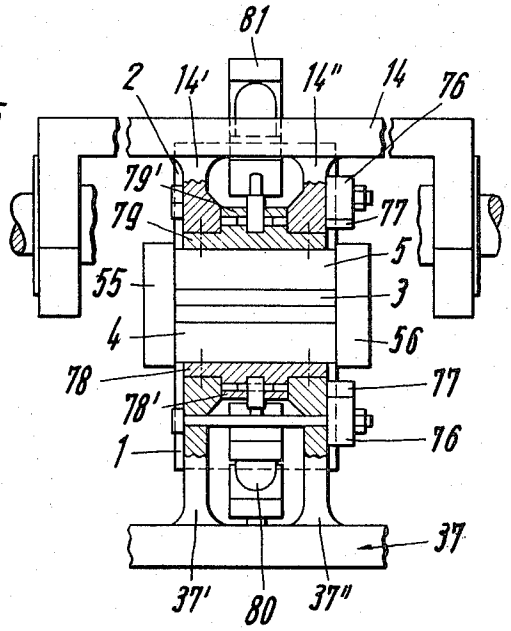

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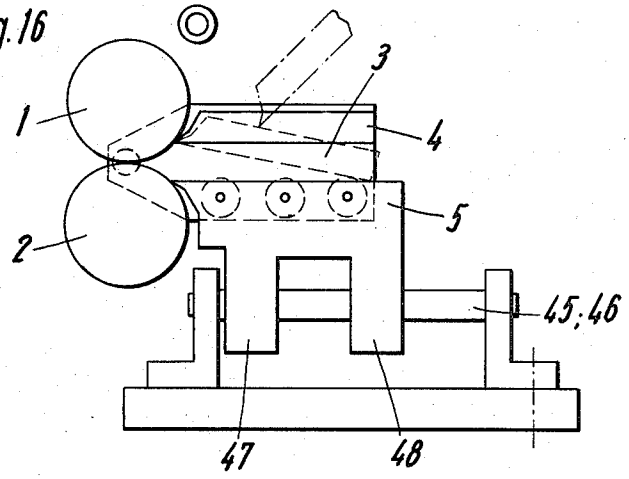
Fig. 16



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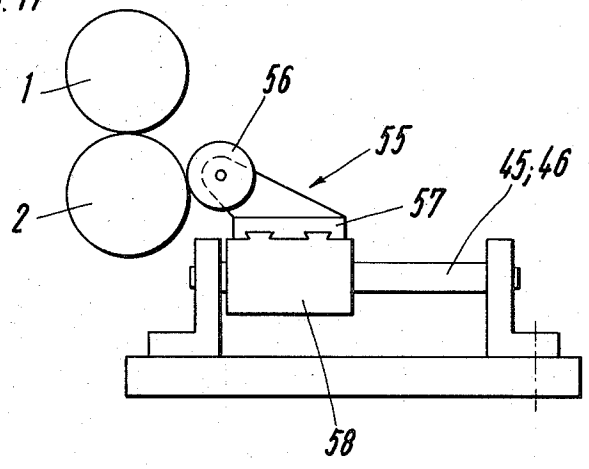

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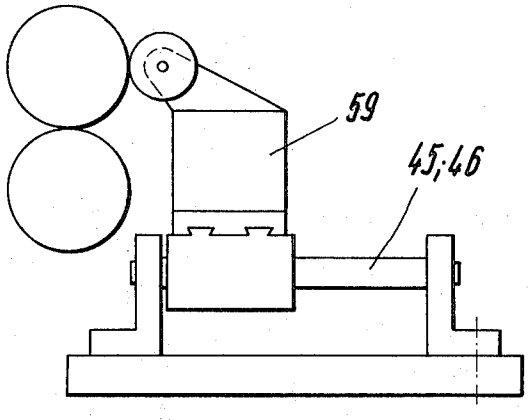

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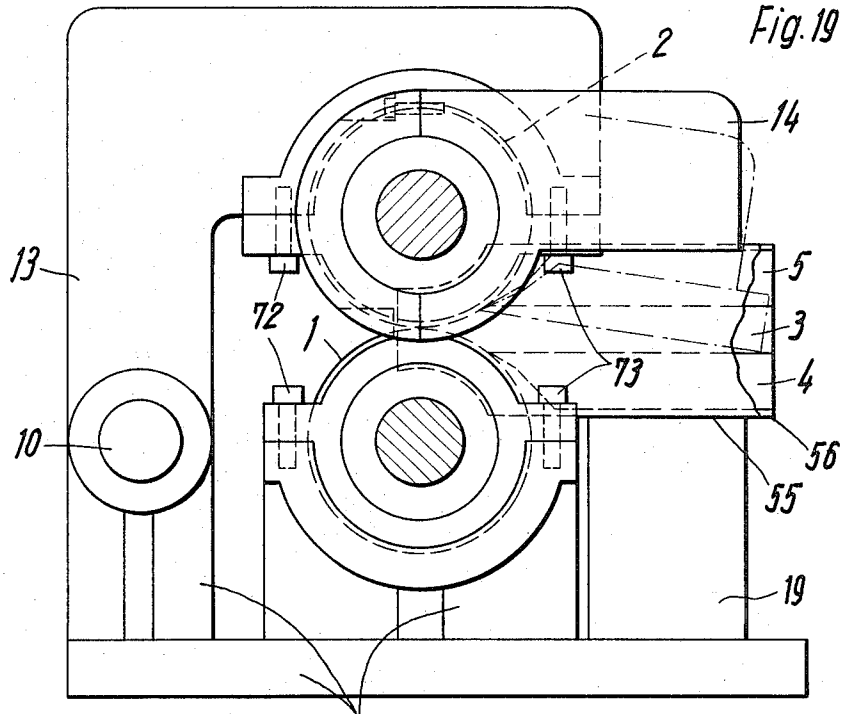
Fig. 19



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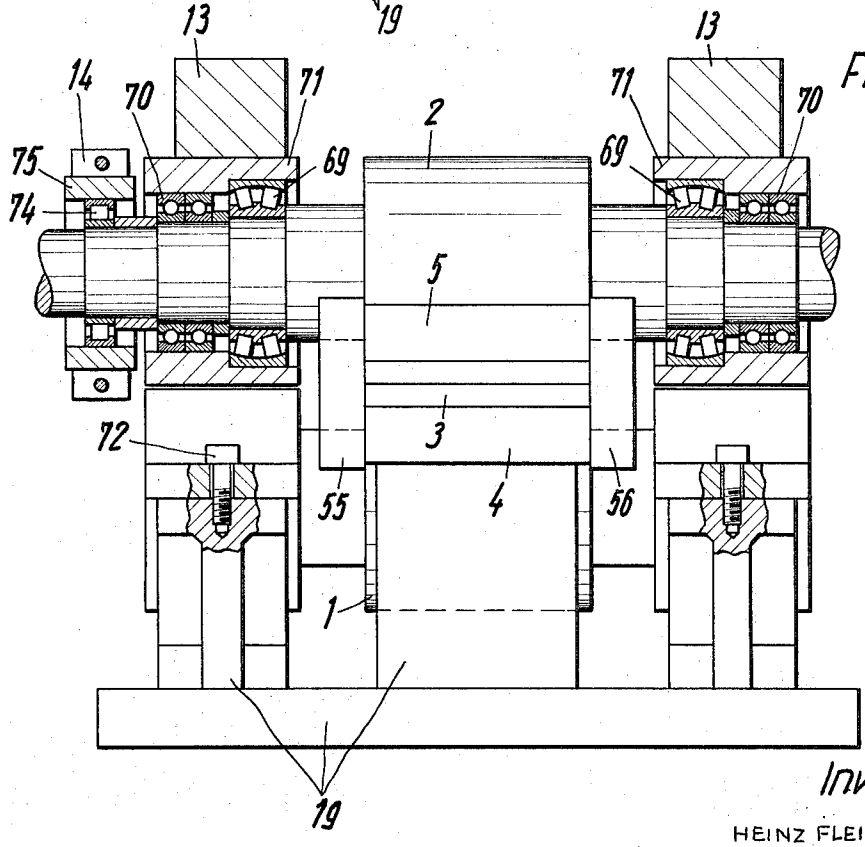

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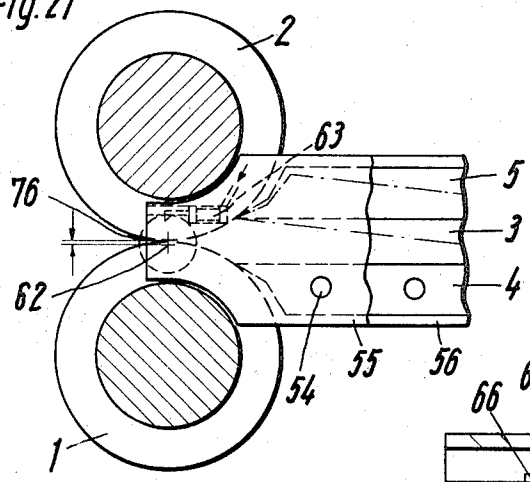
Fig. 21



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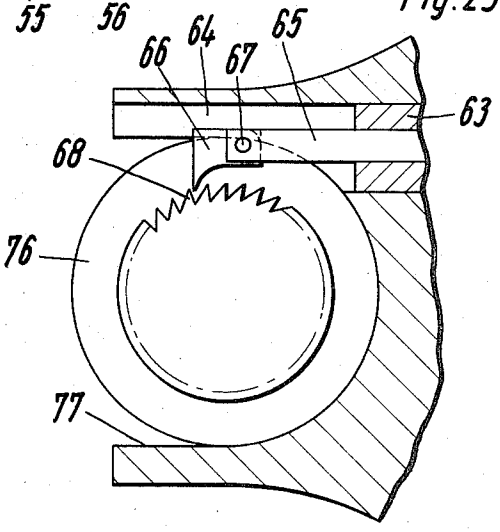

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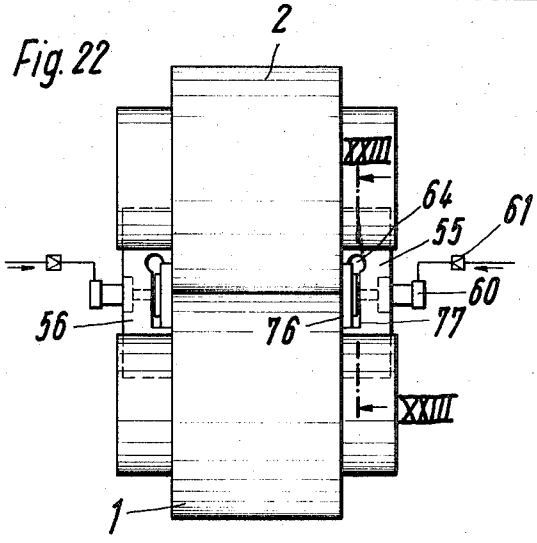

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DEVICE FOR CRIMPING GROUPS OF SYNTHETIC FILAMENTS

This invention relates to a device for crimping groups of synthetic filaments, synthetic fiber bands or synthetic fiber slivers having two rollers that are driven and pressed upon each other at a certain pressure controlled by a piston-cylinder unit, and that are followed by a stuffer box having a compression compartment formed by two plates.

There are various types of stuffer-crimper devices known which are all designed to permit the obtainment of a uniform crimp in textured yarns, threads, bands, or the like. The pressure in the stuffer box which is to be maintained constant and which determines the fineness of crimp is one of the main prerequisities of good quality crimping in the final product; this pressure can be controlled by varying the speed of the feed rollers and by varying the cubic content of the stuffer box. To this end provisions are made for the feed roller speed to be variable and for the plates, rolls, or the like which form the stuffer box to be movable towards each other. It is also possible to restrict the length of the stuffer box by a piston or the like device. This restriction is effected mainly at the beginning of the crimping operation. As soon as the required crimping pressure is obtained in the stuffer box, the plates of the stuffer box are raised upright and may finally be standing parallel to each other.

Despite the diverse possibilities of adjustment provided by the known crimping devices—which adjustment can be automatically effected to ensure the obtainment of a uniform crimp—it is not always possible with these known devices to maintain the pressure in the box constant, i.e., to perform the necessary re-adjustment rapidly enough within a certain period after the initial pressure has changed. The inertia of the individual machine elements was usually too great to permit it any really satisfactory re-adjustment. This is mainly due to the fact that the pressure which is exerted upon the material in the stuffer box depends on the pressure which is built up by the material itself, and that any re-adjustment can take place only after the pressure in the box has been again increased. This time lag and the change of pressure resulting therefrom often causes a non-uniform crimp to be produced.

This non-uniformity will not even be eliminated by the preventive measure of feeding the threads or filamentary bands into a known stuffer box at a constant pressure which can be adjusted independently of the feeding or drawing-off speed at which the material is fed into or discharged from the stuffer box. In this known crimping device, the clutch which serves for driving the feed rollers features a maximum torque and reacts only after a certain force/time interval.

During the continuous operation of this device, the pressure in the box will only change if there are any quantitative irregularities, i.e., a knot, an additional thread or band, or the like passed through the nip of the feed rollers, into the stuffer box.

In order to allow any such irregularities to be passed through the nip of the feed rollers, the rollers of a known device are flexibly or pivotally mounted. This measure, however, does not have any influence upon the pressure in the box which automatically increases if and when a larger quantity of material is fed into the box; in this case the material is more strongly compressed in the box and, as a consequence, a finer crimp is produced.

Taking the construction of the above-described known device as a basis, it is the object of the present invention to provide for some simple constructional modifications of the device and thereby ensure the maintenance of a constant pressure in the stuffer box—even if there occur quantitative changes in the material which is being fed into the stuffer box—and without the need of installing any complicated control elements.

According to the present invention, this object is achieved by connecting one roller and its associated place by intermediate mounting elements so that the two elements form one rigidly connected unit; as a consequence, the cubic content of the stuffer box is increased if and when the distance between the roller axes is increased. It therefore follows that if one of the rollers is lifted up by a knot passing between the nip of the rollers, the cubic content of the box is automatically increased because one of the plates forming the stuffer box is rigidly connected with this roller.

There are several crimping apparatus constructions which will solve these problems. First, it is possible to support the roller and the plate associated with it in one common bearing bracket which is swivelable in the known way, i.e., by pressure, around an axis which is located in front of the pair of feed rollers when viewed in the direction of material passage. However, it is also feasible to have this axis located behind the two rollers when viewed in the direction of material passage. Second, it is also contemplated to mount the roller and the plate to one common bearing bracket which is shiftable by pressure in a guide rail which extends in roughly vertical direction to the plate.

As has been mentioned above, it is known to support at least one section of one of the plates forming the stuffer box in such a way that it is movable towards the other plate by means of a piston-cylinder unit in order to decrease the cubic content of the box.

With a device of the above-described design, the object of the invention is achieved by making the piston-cylinder unit which ensures the movement of the plate act on a plate section which is fixed to the roller. This fixed section preferably also serves for varying the distance between roller axes. For this purpose, the piston-cylinder unit may, for instance, be pivotally mounted to a traverse element which is fastened to a stationary element and at a definite angle to the piston of the piston-cylinder unit which serves for operating the roller.

According to the invention, it is necessary to make provisions for lifting the rollers off each other and at the same time moving the plates which form the stuffer box away from each other. In addition, one of the plates is to be swivelable around the axis of its associated roller so that the cubic content of the box can be varied. This can be easily achieved by mounting the piston-cylinder unit which serves for swiveling the plate and a side bracket which is swivelable around the axis of the roller in such a way that the two elements are together swivelable around the swing axis of the bearing bracket by means of the piston-cylinder unit which acts upon a base plate and which serves for operating the roller.

In a device comprising the side bracket which holds the plate and is swiveled around the axis of the associated roller by means of a piston-cylinder unit, the

last-mentioned piston-cylinder unit can be pivotally mounted to the free end of the side bracket which is connected with the plate and also to the swivelable or shiftable bearing bracket.

It will be recognized that it is of advantage to mount the plates of the stuffer box in such a manner that for cleaning purposes the plates can easily be swung out of the operative position; this is the only way to ensure the rapid and easy cleaning of the delicate plate edges which are near to the surfaces of the feed rollers while the box is in operating position. It is of particular advantage that, with due regard to the above-mentioned characteristics, the piston-cylinder unit which serves for swiveling the side bracket of the device according to the invention, acts on the plate via a swing arm. The two piston-cylinder units used to operate the rollers and to swivel the plate may be replaced by one single piston-cylinder unit which, however, must act upon both the bearing bracket and the swing arm of the plate, via steering rods.

In order to safeguard the mobility of the individual parts of the stuffer box during the actual operation of the device, the exact position of the plates in relation to each other must be guaranteed even with a device which is ready for operation. Still taking the above-mentioned details into account, this special requirement is met by supporting the associated piston-cylinder unit of the device which is ready for operation in bearings both at its front and at its rear end; one of the bearings being designed as a release bearing and the other one being designed as a swivel bearing. It is expedient to design the piston-cylinder unit in such a way that the front end of the cylinder is swivelable around a stationary shaft and the rear end of the piston is supported to be adjustable in a stationary bearing. This ensures the exact position of the plates even if the stuffer box is in operation and at the same time safeguards the required mobility of the plates.

According to the invention, the rear end of the piston which extends through the cylinder can be provided with a lock including a threaded connection or spindle upon which a swing lever or the like can be screwed, and which is tightened against the stationary bearing. This provision permits the fixation of a plate in any required position to the other plates. If the production line or the device only is to be cleaned, the lock has to be loosened and the piston-cylinder unit to be swung out around the bearing at its front end; this permits the easy access to the edge of the plate which is normally adjacent to the surface of one of the rollers.

As has already been mentioned above, it is necessary to move one of the two plates which form the stuffer box or at least one section of this plate towards the other plate when starting the device in order to retain the material which is fed into the stuffer box within this box. The material is then accumulated in the box and creates of itself the pressure which is required for crimping; after the required pressure has been reached, the plates of the box will be forced apart each other. This movement of one of the plates can also be effected by means of piston-cylinder units. When swiveling the unit in order to decrease the cubic content of the stuffer box, care has to be taken that the entire unit swings around the central point of the respective roller because otherwise the sharp edge of the plate touching the roller might be damaged or a slit be produced between the roller and the plate.

For cleaning purposes, too, this plate must be easily accessible; according to a prior patent application, easy access is achieved by supporting the plate in such a manner that it is swivelable. It has been found by experience, however, that the position of the plate, too, has to be exactly adjustable. In accordance with the present invention, this adjustment of the plate position required to achieve the object of the invention is safeguarded by letting the stationarily supported piston-cylinder unit act on a side bracket which is swivelable around the axis of one of the rollers; the plate is thus swivelable in relation to the side bracket and can be set to any desired position. To ensure the exact adjustment of the plate, it is of advantage to provide the side bracket with a buffer or cushioning stop for the plate itself and, respectively, for its bearing bracket. For stability reasons, this buffer ought to be mounted behind the hinge in the bearing bracket. If the free end of the side bracket rests upon the buffer, it is possible to swing the plate either by hand or by means of an additional piston-cylinder unit around its bearing in the side bracket, which facilitates cleaning the plate edge.

It has also been found that the swivel mounting of the plates greatly facilitates their cleaning and mounting, particularly in dismantling. The bearings of the plates, however, must be very sturdy, especially if coarse yarns are to be crimped, in order to ensure the exact position of the plates in relation to the feed rollers, during extended use. Pressure may be so high that the otherwise advantageous swivel bearings are no longer recommendable. This problem may be solved by supporting at least one of the plates of the stuffer box or even the stuffer box as a whole so that it can be shifted in relation to the pair of feed rollers. This slide bearing can be of very sturdy construction while at the same time featuring relatively small dimensions. A slide conveyor, for instance, is very safe and easy to mount and permits the translatory shifting of the plate as well as shifting the plate in vertical direction to the plane formed by the axes of the rollers. The plate or the stuffer box as a whole can be shifted either by hand or by means of a threaded spindle with a crank or some other means such as a piston-cylinder unit.

To permit the exact alignment of the plate with respect to the stuffer box as a whole to the pair of feed rollers and to permit the easy re-alignment of the device after cleaning, the present invention provides for an adjusting unit or means, e.g., a screw connection, which is mounted to the plate or the side bracket of the plate and which touches with its head upon a bearing bracket. If the plate is shifted by means of a piston-cylinder unit, adjustment can be effected by means of this very unit because electrically operating means cause the shifting of the plate.

Another possible construction for providing a sturdy and accurate bearing consists in supporting the plate in guide bars. It is of advantage if these guide bars are embraced by the plate itself or by its bearing arms. This type of slide guidance is advantageous insofar as round surfaces such as bore holes can be more easily and often more precisely machined than plane surfaces.

It is even more advantageous to support the plate in ball-bearing sleeves on the bars, which ball-bearing sleeves can preferably be provided with fixable, axially directed slits. This type of bearing guarantees the safe sliding and secure support of the plate; there is no need

of providing for the otherwise required manufacturing tolerances.

It has been contemplated to construct the slide guidance as a dovetail assembly, for instance, or as a guidance with round bars. It is still better, however, if the plate is in its operating position fixed to the bearing bracket or any other mounting elements so that it is easily removable. This measure will make excessively accurate slide guidance unnecessary. What is very important in this case is the exact position of the plate in its operating state in relation to the rollers. If the plates are to be removed from the rollers, it is possible to attach them quite loosely to the device. After cleaning, for instance, the plates have only to be re-set to their initial position, which resetting can be easily effected by making use of the embodiment of the present invention.

The connection between the plate and the elements which hold it is preferably constructed so that the plate is provided with a special guide plate which is mounted to the side which is turned away from the stuffer box. This guide plate extends on a rail between two preferably spring-mounted arms of the bearing bracket. In this arrangement, it is of advantage if the piston of the piston-cylinder unit is pivotally mounted to the rail which serves for setting the plate to its cleaning positon and also for resetting it to its operating position.

The manufacturing costs of any such device with the above-described characteristics are very high. Manufacturers therefore have tried to build larger stuffer boxes which would permit the treatment of wider filamentary bands or of several bands at a time. It was found, however, that this led to a deterioration of the final crimp: The crimp was not uniform, and the required larger roller widths were found to have the disadvantage that the pressure across the width of the feed rollers was not uniform.

The manufacture of very efficient crimping machines is rendered less expensive by subdividing both the plates and the feed rollers at least once over their width so that the bearing serves as supporting assembly of at least two crimping devices with optimum working widths. Since the bearings are one of the largest cost factors in the manufacture of the crimping device, the above measure will, apart from simplifying the construction, also reduce prime costs.

The production costs and the operating costs of the feed rollers are another very important point.

To ensure the accurate feeding of the textile material into the stuffer box, the feed rollers of the crimping device must exhibit an absolute true rotation and have smooth surfaces without any grooves. The machining of the rollers does not present any problems. Problems usually arise, however, when the machine has been put into operation and has been operating for a certain time. The constant friction of the material on the rollers will render the hard ground roller surface rough, and there will be grooves produced which impede the accurate drawing-in of the fibrous bands or like material. The rollers have then to be re-ground, i.e., they have to be dismounted and possibly shipped back to the manufacturer's works.

Dismantling the rollers from the pedestal or frame of the device is very difficult. The bearings of these rollers which have to stand pressures of several metric tons have to be very large indeed and must be accurately guided because any dislocation of the rollers either in radial or in axial direction must be avoided. The pressure exerted by the textile material which is being drawn into the stuffer box suffices to make the rollers bend in their middle section; the material band then runs through the higher nip, the drawing-in speed varies across the width of the rollers, and, as a consequence, there is a non-uniform crimp produced. A displacement of the rollers in axial direction leads to create a higher nip or spacing at the side walls of the stuffer box; and, consequently, there is the danger of fibers sticking between the machine parts performing a relative motion. To ensure the safe operation of the device, these parts have to be thoroughly cleaned. From the above description, it will be realized that dismantling and re-mounting a roller which is to be exactly supported in its pedestal is both very difficult and time-consuming. Unless there are several exchange crimping machines operating, these mounting operations will necessitate long standstills of the respective production line. The losses resulting therefrom are considerable.

Advantageously, this problem can be solved by equipping the device of the invention with a grinding mechanism which is placed adjacent to the feed rollers, i.e., by putting a grinding mechanism onto the plates which form the stuffer box each time the stuffer box is cleaned, and to re-grind the roller surfaces to their initial smoothness on the spot, i.e., without having to dismantle them. This measure permits re-grinding the rollers more often than actually necessary and eliminates any danger of grooves being produced which would certainly lead to the production of an inferior crimp.

As heretofore noted, this measure permits the rapid and easy re-machining of the rollers. However, although dismantling the device is unnecessary, the operators who are entrusted with the task of servicing the device will have to perform certain functions which are normally carried through by highly skilled mechanical engineers. The absolute smoothness of the re-ground roller surfaces is therefore not always guaranteed, and it may even be necessary to after all dismantle the rollers and transport the rollers to the manufacturer's works where they are then re-ground by means of special machines.

Re-grinding the roller surfaces will be even easier if the bearings of at least one of the rollers are embraced by separate bearing rings which in turn are fastened to the pedestal or frame support of the device. This makes it unnecessary to remove the individual bearings from their shafts before removing the rollers themselves from the pedestal. The only works to be done are to loosen the screws or the like by which the bearing ring is fixed to the pedestal and then to remove the entire roller together with its very delicate bearings from the crimping device. Thereupon, the roller may either be replaced by a spare roller of the same type or be transported to the manufacturer's works for repairing. In any case, the exchange of a feed roller will not entail any long standstills of the textile production line, or are there any expert workers or special tools required.

It is also possible to prevent the plate edge which faces a roller from coming into contact with the surface of the roller when being swiveled in order to decrease the cubic content of the stuffer box by supporting this plate in such a way that it is swivelable around the roller axis. With the bearing required herefor, too, this measure according to the invention is of great advan-

tage: In this case the bracket which serves for swiveling the plate is mounted to a separate bearing ring which, in its turn, embraces the roller bearing.

Apart from the above-described characteristics of the crimping device, it will be understood that the zones or points where the nip of the feed rollers and the lateral walls of the stuffer box are adjacent to each other are very critical points.

To prevent material particles from accumulating at these points or zones where relative speeds are prevailing and from thereby endangering the crimping process, it is absolutely necessary to provide for a hard, one-hundred-percent sealing of these points. One measure to this end consists in sinking thrust washers into the lateral walls which washers are surface-ground with high precision and seal against the faces of the feed rollers. Since, under the influence of pressure, the washers rest on the faces of the rollers, they are subject to wear and become very quickly useless, i.e., they have to be very often dismounted and replaced by new ones.

In order to eliminate the disadvantages which are caused by the stoppages required for exchanging the thrust washers said thrust washers may be replaced by endless belts which run around the nip of the feed rollers. This measure ensures the constant sealing of the critical points by unworn belt sections. Very difficult problems, however, are not only the obtainment of a very accurate guidance of the sealing belt with its drive but also the obtainment of a sufficiently great pressure against which the belt has to run. Such an endless sealing belt replacing the thrust washers or even the side walls of the stuffer box does by no means ensure the trouble-free operation of the crimping device over extended periods.

According to the invention, this problem is overcome by still using the known thrust washers which ensure a perfect sealing at least for a particular period. In this case, however, means must be provided to eliminate any danger of spotty wear.

This problem may be solved by supporting the thrust washers so that they are swivelable in parallel direction to the roller axes. It is very advantageous indeed if the washers turn continuously so that they are worn on their entire surfaces, i.e., over the total surface which is in contact with the roller faces. If, in addition, the revolution axis of the thrust washer is located eccentric from the roller nip, there will not even be any triblet produced, which could be the case if only certain sections of the washer are worn; the thrust washer can thus be used without interruption until a certain minimum thickness of the disk is reached and there is no danger of the crimp becoming inferior. This above-described measure will ensure an excellent one-hundred-percent sealing of the two ends of the roller nip, which sealing cannot be guaranteed by endless sealing belts.

It is obvious that the uniform wear of the thrust washer is only ensured if the thrust washer turns continuously around its axis. To this end, it is advantageous to equip the thrust washer with an automatically operating adjustment element, e.g. a piston-cylinder unit, the piston of which is at its free end provided with an adjustment head which engages with a toothing or gearing in the thrust washer.

The device of this invention will be further understood from the following detailed description and from the various embodiments shown in the accompanying drawings, in which:

FIG. 1 is a schematic view of a crimpng device of the invention with a swivelable bearing bracket;

FIG. 2 shows another embodiment of the crimping device according to FIG. 1, with a shiftable bearing bracket;

FIG. 3 shows an embodiment of the crimping device according to FIG. 2 in which one plate of the stuffer box is also swivelable;

FIG. 4 shows an embodiment of the crimping device of FIG. 1, in which the stuffer box plate, also, is swivelable;

FIG. 5 is a detailed view of the crimping device with the swivelable bearing bracket standing in a certain position while one roller and the respective plate are lifted off the other roller;

FIG. 6 shows the crimping device according to FIG. 5 in two different operating positions;

FIG. 7 shows the crimping device according to FIGS. 5 and 6, in which the plates of the stuffer box are swung out;

FIG. 8 is a cross section through a device for crimping groups of synthetic filaments, in the non-operative position;

FIG. 9 is a view of the device according to FIG. 8, seen in the direction of arrow A;

FIG. 10 is a top view of a device similar to that shown in FIG. 8, however, with another type of adjusting unit;

FIG. 11 shows a device for crimping groups of synthetic filaments similar to that shown in FIG. 8;

FIG. 12 is a view of the device according to FIG. 11, seen in the direction of the arrow B;

FIG. 13 is a section through the device according to FIG. 12 taken along the line XIII—XIII;

FIG. 14 is a longitudinal section through a crimping device which is similar to that shown in FIG. 11;

FIG. 15 is a partial view of the crimping device according to FIG. 14;

FIG. 16 is a cross section through a crimping device which is similar to that shown in FIG. 11;

FIG. 17 shows the basic design of the crimping device according to FIG. 16, however, without stuffer box and with a grinding mechanism;

FIG. 18 shows the device according to FIG. 17, however, with a different location of the grinding mechanism;

FIG. 19 is a longitudinal section through a crimping device;

FIG. 20 is a section through the axis of the top roller of the pair of feed rollers according to FIG. 19;

FIG. 21 shows the end of the crimping device at which the pair of rollers is located;

FIG. 22 shows one end of the pair of rollers; and

FIG. 23 is an enlarged view of a section through the adjusting unit taken along the line XXIII—XXIII in FIG. 22.

The device of this invention for crimping groups of synthetic filaments essentially consists of rollers 1 and 2 which form a pair of feed rollers and of a subsequent stuffer box 3 which is formed by upper and lower box plates 4 and 5. Side plates which form the lateral walls of the stuffer box are not shown. FIGS. 1 and 4, which primarily serve for describing the operating principle, show a bearing bracket 13 serving as a rigid connection between the roller 2 and the plate 4. Bearing bracket 13 is swivelable around a hinge 10. According to FIGS. 1 and 4, this hinge 10 is located in front of the pair of

rollers. In the embodiment of FIGS. 2 and 3, the bearing bracket 13' runs in a parallel construction 30 whereby it can be shifted in the vertical direction to the plate 4 which is shown in its operating position.

The respective bearing bracket 13 or 13' is put into operation by a piston-cylinder unit 25 which is stationarily supported at a point 31 and the piston 11 of which is more or less pushed into the cylinder of the unit 25, depending on the angle of swing of the bearing bracket 13 in FIGS. 1 and 4, respectively, or on the degree of shift of the bearing bracket 13' in FIGS. 2 and 3. If, for instance, a material knot passes the nip of the rollers 1 and 2, the bearing bracket 13 or 13' swings or shifts to the position which is shown by the dash-dotted lines in FIGS. 1 and 2.

FIGS. 3 and 4 also show the possibility of swiveling the plate 4 into its cleaning position (shown in FIG. 4) and also to the position in which it is swiveled around the center point of the roller 2 in order to decrease the cubic content of the stuffer box 3 at the beginning of the crimping process (shown in FIG. 3). To this end the plate 4 is supported in a side bracket 14 in order to be swivelable around an axis 7 and connected with the piston of a piston-cylinder unit 9 which is fastened to the bearing bracket 13' by a swivel arm 8.

In its operating position, the plate 4 rests upon a stop 14'. The dash-dotted lines in FIG. 3 show the plate 4 while it is swung in to decrease the cubic content of the stuffer box 3. To achieve this, the piston projects out of the cylinder of the unit 9.

For cleaning purposes, the piston is pushed into the cylinder of the unit 9, the plate 4 is swiveled around ahinge 7 and reaches the position (corresponding to that indicated by the dash-dotted lines in FIG. 4) while the side bracket 14 rests with a stay 32 upon the bearing bracket 13'.

FIG. 4 shows an embodiment for swiveling both the plate 4 and the bearing bracket 13 by means of one single piston-cylinder unit 25. In this embodiment, the free end of the piston 11 of the unit 25 acts upon both the bearing bracket 13 and a swivel arm 8, via steering rods 33. Limiting elements 34 which are shown in FIG. 4 serve for restricting the angle of swing.

FIGS. 5 and 6 show in detail the apparatus which was schematically shown in FIGS. 1 and 4. The rigid connection between the plate 4 and the roller 2 consists of the bearing bracket 13 which is swivelable around a hinge 10; the side bracket 14 which is swivelable around the axis of the roller 2; a piston-cylinder unit 23 which serves for swiveling the side bracket 14; and a traverse rod 24 which is fixed to the piston 11 of the piston-cylinder unit 25 stationarily fixed to a base plate 19. The unit 25 serves to the axis of the roller 2, and the traverse is connected with the unit 23 by a hinge 35. It will be appreciated that as soon as the unit 25 is actuated or a knot passes between the nip of the rollers 1 and 2, the plate 4 is lifted up and, as a consequence, the space 3 between the plates 4 and 5 is increased in size. The result hereof is that even in case there are irregularities such as knots or the like fed into the stuffer box, there is a quite uniform crimp produced. There is no danger of the pressure in the stuffer box suddenly increasing by any such quantitative changes in material feed. There is no need for any electronic control instruments with delicate feeling elements.

This construction of the device is very advantageous because it permits swiveling the plate 4 to the inside in order to decrease the cubic content of the stuffer box 3 and also, to swing the plate out in order to clean it. FIG. 6 shows the manner in which the plate 4 can be swiveled around the axis of the roller 2 in order to decrease the cubic content of the stuffer box. To this end the piston 23' of the piston-cylinder unit 23 which is fixed to the bearing bracket 13 via the piston 11 and the traverse 24 is pivotally mounted to the free end of the side bracket 14. If the piston 23' is pushed into the cylinder of the unit 23 either by pneumatic or by hydraulic force, the side bracket 14 and, consequently, the plate 4, too, swing to their positions indicated by the dash-dotted lines.

If, on the other hand, the plate 4 is to be swung out so that its edge which is usually adjacent to the roller 2 can be cleaned, this swinging motion can be effected in different ways. First, the piston 11 of the unit 25 can be entirely pulled out of the cylinder and thereby swivel the upper part of the device around the axis 10 into the position to be gathered from FIG. 5. In addition, the piston 23' of the unit 23 may swivel the side bracket 14 around the center point of the roller 2. Furthermore, the plate 4 with its double bracket 29 can be moved around a hinge 16 at the side bracket 14, i.e., after the lock 27 at the bearing bracket 26 has been loosened. On termination of the cleaning operation, the double bracket 29 and the plate 4 are re-set and exactly adjusted to their initial positions by means of a screw 27, which measure ensures the permanent and exact alignment of the plate 4 to the other elements of the device.

The plate 5 can be swiveled around an axis 15 by means of a piston-cylinder unit 9, the piston 18 of which is with one of its ends pivotally mounted to a double bracket 17 of the plate 5 and with its other end fixed to a stay 21 on the base plate 19 of the device. Adjustment is effected by means of a screw 20 which engages with the threaded end of the piston 18 and rests on the stay 21 of the base plate 19. To swivel the plate 5 into its cleaning position, it is necessary to undo the screw connection between the piston and the base plate, to swivel the unit 9 around the stationary hinge 22 at the base plate 19, and to push the piston 18 out of the cylinder by pneumatic force, for instance. The unit 9 will thereupon be in the position shown by the dash-dotted lines in FIG. 7. If the plate is to be re-set to its operating position the unit 9, too, has to reassume its original position.

This re-setting is effected by means of the screw 20 which permits the exact re-alignment and arresting of the plate 5. The sturdy connection of the unit 9 with the base plate 19 ensures the safe and accurate adjustment of the plate 5 in its operating position.

The above description is equally valid for the construction of the swivel unit acting on plate 4. This plate 4 is swivelable not only around a hinge 16 but also around the axis of the roller 2 via the side bracket 14. Swiveling the plate 4 around the axis of the roller 2 is ensured by the piston-cylinder unit 23, the piston 23' of which is connected with the free end of the side bracket 14, and the cylinder of which is fixed by a stay 24 to the piston 11 of the unit 25 which in this operation is of minor importance and serves for swiveling the roller 2 around the hinge 10 via the element 13.

If the plate 4 is to be swiveled from its operating position into the cleaning position which is indicated by the dash-dotted lines in FIG. 7, i.e., if it is to be swiveled

around the hinge **16** at the side bracket **14**, the lock at the bearing bracket **26** is loosened by means of the screw **27** and the plate **4** may be manually swiveled to the position indicated by the dash-dotted lines. Similar to the plate **5**, the plate **4**, too, can be arrested in its operating position by the screw **27** and a screw **28** at the bearing bracket **26**. The screw **28** serves as a counter element. The plates **4** and **5** forming the stuffer box **3** can thus be easily cleaned without any need of long standstills; since they can thereafter be most exactly re-adjusted to their operating position, there is always a uniform crimp obtained.

FIGS. **8**, **9** and **10** show another embodiment in which the individual parts of the stuffer box can be swiveled to their cleaning position. With the embodiment of the device according to FIG. **8**, the top plate **4** (in the manner heretofore described) can be swiveled to its operating position which is indicated by the dash lines and then possibly swiveled to its cleaning position indicated by the dash-dotted lines, while the bottom plate **5** is supported in a slide of dovetail unit **36**. The sliding rails of the dovetail unit **36** are cut into the bearing bracket **37** on the front plate **38** of which there rests an adjusting screw **40** which is located in the side bracket **41** of plate **5**. This adjusting assembly ensures that, after having been cleaned, the plates are exactly re-set to their initial positions, i.e., that there is only an infinitesimal slit between the plate edges and the surfaces of the feed rollers **1** and **2**.

Shiftability of the plate **5** is safeguarded by a threaded spindle **39** which is mounted to the bearing bracket **37**. This stationary spindle **39** is embraced by the side bracket **41** of plate **5**; it is thus possible to move the plate **5** in relation to the bearing bracket **37** by turning the threaded spindle **39** with a crank which can be slipped onto the end of the spindle.

Apart from being shiftable by means of the above-described threaded spindle (as shown in FIG. **8**) the plate and/or the entire stuffer box can be shifted by hydraulic or pneumatic force, by electrically controlled piston-cylinder units of the type shown in FIG. **14**. After cleaning, each plate respectively, the entire box can be re-adjusted to its initial position by means of a tripping mechanism. This feature is shown in FIG. **10** where the already described machine elements are supplemented by a hand lever **42** with eccentric clamping disk **43**. This clamping disk acts on the extended plate **5**, at the side which is turned away from the rollers **1** and **2** and at one side of the bearing bracket **37**. At the other side of the bearing bracket **37**, the plate **5** is fixed by a bolt **44** which is, for instance, supported to be swivelable around one end. Consequently, the extended plate **5** is provided with a keyway the size of which corresponds to the outer diameter of the bolt **44**. This type of quick-adjusting lock ensures the easy and rapid dismantling and re-mounting of the stuffer box.

In contrast to FIGS. **8** to **10**, FIGS. **11** to **13** show an embodiment of the crimping device in which the bearing assembly of plate **5**, the stuffer box essentially consists of two round rods **45** and **46**. These rods are embraced by the bearing brackets **47** and **48** of plate **5**, and that at a certain distance. Touch contact between the bearing brackets and the rods is effected by ball-bearing sleeves **49** which can be shifted on the bearing brackets (shown in FIG. **13**). However, it is also feasible to use simple bearing bushings **49'**. It is here of advantage if the bearing brackets are provided with longitudinal slits **50**, **51** adjustable by means of screws or the like. It will be understood that the ball-bearing sleeves are easy and inexpensive to manufacture and ensure the exact alignment of the plate **5** as well as its easy shiftability in the long run.

The plate **5** is shifted along the guide rods **45**, **46** by means of a piston-cylinder unit **52** which is mounted in the middle between the rods **45** and **46**, on the foundation of the device; the free end of the piston acting on the plate **5** via an additional bracket **53** which is arranged underneath the plate.

FIG. **12** further shows that it is also contemplated to mount two stuffer boxes **3'** and **3''** to the bearing assembly of the device. The two boxes consist of a top plate **4** and a bottom plate **5** with lateral limiting elements which may be fixed to the bottom plate **5** by pneumatic clamping units **54**. Each of the stuffer boxes **3'**, **3''** is adjoined to a pair of feed rollers consisting of roller **1** and roller **2**, each.

Contrary to the embodiments of the device shown in FIGS. **8** to **13**, those shown in FIGS. **14** and **15** are equipped with plates **4** and **5** which are only fixed when being set to the operating position. To this end, the guide plates **78**, **79** of the box plates **4**, **5** are at those sides which are directed away from the stuffer box **3** stationarily fixed to the bearing bracket **37** or the side bracket **14**, by pneumatic locking units **76**, **77**.

The guide plates **78**, **79** are T-shaped; the respective crossbar rests upon two arms **37'**, **37''** of the bearing bracket **37**, and on two arms **14'**, **14''** of the side bracket **14**. That part of the guide plate **78**, **79** which is standing vertical to the above-mentioned crossbar is in the drawing designated as rail **78'**, **79'**. The rail **78'**, **79'** extends between the two arms of the respective bearing bracket and is fixed quite tightly to the bearing bracket by means of a locking unit **76**, **77**. The above-described provisions ensure the tight arresting of the guide plate **78**, **79** and thereby of the plates **4**, **5** of the stuffer box in their operating positions.

If the plates **4**, **5** of the stuffer box are to be swiveled from their initial position (as shown in full lines) to their cleaning position indicated by the dash lines, the locking units **76**, **77** are loosened at a control desk (not shown) and the inclined piston-cylinder units **80**, **81** are actuated. The cylinder of the unit **80** which is associated with plate **4** is pivotally mounted to the bearing bracket **37** while the piston of the unit **80** is pivotally mounted to the rail **78'** of the guide plate **78**. When the piston of unit **80** is pushed out of the cylinder, the unit swivels or pivots around the axis at the bearing bracket **37** and shifts the plate **4** in relation to the roller **1**. The degree of shift is limited by the locking units **76**, **77** which are located at both sides of the piston and extend between the arms **37'**, **37''** of the bearing bracket **37**. If the plate **4** is to be re-set to its operating position, the piston-cylinder unit is again actuated until an adjusting screw **40** touches upon the front edges of the slide arms **37'**, **37''**. This measure ensures the exact re-alignment of the plate **4** in its operating position.

The piston-cylinder unit which serves for shifting plate **5** is mounted in about the same way as unit **80**. Unit **81**, however, is not supported in the bearing bracket **37** but in the side bracket **14** which is connected with the bearing shaft of the roller **2** and serves for swiveling the box plate **5** to its operating position (as shown in dash-dotted lines). To align the plate **5** to

the side bracket **14**, a screw **40'** is also provided. In this case, too, the hinge joint of the piston of the piston-cylinder unit **81** with the rail **79'** is arranged between the two locking units **76, 77**, which ensures the safe fixing of the flexibly mounted arms **14', 14''** to the rail **79'** and, as a consequence, the safe adjustment of the plate **5**.

FIGS. **16** to **18** show an embodiment which permits the rapid regrinding of the feed rollers **1, 2**. According to this embodiment, the individual parts forming the stuffer box cannot only be shifted in the direction of material passage but can be completely removed; on having removed these parts, a grinding mechanism **55** is slipped onto the guide rods **45, 46** by means of which mechanism **55**, the feed rollers **1, 2** can be easily re-machined in situ. The mechanism comprises a grinding disk **56** which is mounted on a sledge **57** which can be shifted on a base plate **58**, along the rollers **1, 2**. To grind the top roller **1**, the sledge **57** is equipped with an intermediate part **59** which permits grinding this roller while using the same sledge (see FIG. **18**).

FIGS. **19** and **20** show a particularly advantageous construction for the feed roller bearings.

From FIG. **20**, it may be recognized that the feed rollers must be supported in several ball bearings which can together stand several tons of pressure. The rollers **1, 2** must not have any axial play because otherwise the very fine slit between the side walls **55, 56** and the rollers or the plates **4, 5** would be changed. To ensure that the bearings actually stand the high pressures and also, that there is not any axial plate whatsoever, each roller is at each of its sides equipped with one self-aligning ball bearing **69** and one play-free tilted ball bearing **70**, the latter type being shown as a spindle bearing.

These bearings **69, 70** are embraced by bearing rings **71** which are fixed to the bearing bracket **13** or, as far as roller **1** is concerned, directly to the pedestal **19** by means of screws **72, 73** (see FIG. **19**). These screws permit the easy mounting or dismantling of the rollers **1, 2** together with their respective bearings **69, 70**.

The side bracket **14** which serves for adjusting the top plate **5** of the stuffer box is also supported on the axis of roller **2** by a ball bearing **74** which is not directly fixed to the side bracket **14** but is also surrounded by a separate bearing ring **75** which is fastened to the bracket in substantially the same way as the bearing ring **71**.

As has already been described, the side plates **55, 56** are fastened to the bottom plate **4** by means of screws **54** or the like in order to be removable (see FIGS. **21** and **22**). There are thrust washers sunk into the side plates **55, 56** in level with the nip of the feed rollers, which thrust washers are freely turnable in a keyway **77**. These thrust washers are each pressed against the respective roller faces by a piston-cylinder unit **60**.

The thrust washers **76** are subject to a constant pressure which is high enough to cause the thrust washers **76** to rest on the faces of the rollers **1, 2** with as little danger of wear as possible. If, however, a certain degree of pressure is exerted upon the thrust washers **76** from the direction of the nip of the rollers, the thrust washers are arrested in their position by the head or pressure of liquid applied to the valve **61** which acts in one direction only. The possibly existing pressure from the roller nip may by far exceed the pressure exerted by the piston-cylinder unit **60** onto the respective thrust washer **76** wihtout causing any lifting of the thrust washers **76** from the nip, i.e., from the roller faces.

The surface of the thrust washer **76** which faces the roller **1, 2** constantly rasps on the outer sections of the rollers. This causes the thrust washers **76** to be rapidly worn and become useless. To eliminate this, the thrust washers **76** are continuously turned around an axis **62** while the crimping device is operating. The axis **62** is located at a certain distance X from the roller nip so that the section which is not covered by the rollers **1, 2** is also worn. Therefrom follows that if the axis **62** of the thrust washer **68** is eccentrically shifted in relation to the nip, the thrust washer is uniformly worn across its entire surface with which it rests on the roller face.

The revolution of the thrust washer **76** in the keyways **77** which serve as bearings can be effected in various ways. According to the invention, there is a piston-cylinder unit **63** which is fixed to a recess **64** in the side plate **55** (**56**). The free end of the piston **65** of the unit **63** is equipped with an adjusting head **66** which is swivelable around the hinge **67** in the piston rod **65**. This adjusting head **66** engages with an external toothing **68** which is provided in the thrust washer **76** and has a smaller diameter than the washer itself.

This design permits the continuous revolution of the thrust washers **76** around the axis **62**, and that at any required speed and by the means of the piston-cylinder units **63**. The side of the thrust washer **76** which faces the roller face will thus be uniformly worn during the operation of the crimping device. At the same time, there is a constant pressure exerted upon the thrust washers **76** by the non-return valve **61** whereby the constant sealing between the thrust washer **76** and the feed roller nip is obtained.

It will be understood that the piston-cylinder units employed in the device of this invention may be electrically, pneumatically or hydraulically actuated by appropriate control means. Often compressed air is used to actuate these units.

What is claimed is:

1. In a device for crimping groups of textile filaments comprising a pair of opposing rollers disposed one above the other, one of said rollers being mounted in a stationary manner and the other of said rollers being swivelably mounted, a compression compartment comprising a plate and a bottom plate connected to side plates, said compression compartment being associated with the nip of the rollers on one side of said rollers, the improvement which comprises a swivelable top plate and a bottom plate which is stationary in operating position, first piston cylinder means associated with the top and bottom plates of the compression compartment for moving the plates of the compartment out of operating position and second pressure cylinder means associated with the top roller for pressing the top roller against the bottom roller, said second piston cylinder means being disposed below a base plate for supporting said device and the pistons of said second piston piston cylinders extending laterally past the bottom roller and third piston cylinder means for swiveling the top plate to reduce space in said compression compartment in the operating position, pistons of said second and third pressure cylinder means being arranged substantially parallel to each other.

2. The device of claim **1**, in which the stuffer box is formed by a plurality of plates and at least one section

of the top plates can be swiveled toward the opposing plate to decrease the volume of the stuffer box, the third cylinder means which serves for swiveling said top plate, acting upon a mounting element which is rigidly fixed to the associated roller.

3. The device of claim 2, in which said third piston cylinder means acts upon support means that is connected with said top roller and that serves for varying the distance between the roller axes.

4. The device of claim 3, in which the support means acted upon by said third piston cylinder means includes a traverse pivotally mounted to said unit, said traverse being fixed at a certain definite angle to the piston of the second piston cylinder means which serves for actuating said one roller.

5. The device of claim 4, in which the third piston cylinder means which serves for swiveling a associated plate and the side bracket which is swivelable around the axis of the roller are swivelable around the swivel axis of a bearing bracket by said second piston cylinder means which acts upon a base plate and serves for moving the top roller.

6. The device of claim 3 further comprising a side bracket which holds said top plate and is swivelable around the axis of the associated roller by said third piston cylinder means, said third piston cylinder means being pivotally mounted both to a free end of the side bracket connected with said top plate and to the support means.

7. In a device for crimping groups of textile filaments comprising a pair of opposing rollers disposed one above the other, one of said rollers being mounted in a stationary manner and the other of said rollers being swivelably mounted, a pressure compartment comprising a top plate and a bottom plate connected to side plates, said compression compartment being associated with the nib of the rollers on one side of said rollers, the improvement which comprises a swivelable top plate and a bottom plate which is stationary in operating position, first piston cylinder means associated with the top and bottom plates of the compression compartment for moving said plates of said compartment out of operating position and second piston cylinder means associated with the top roller for pressing the top roller against the bottom roller and means operatively associated with at least said bottom plate to enable said bottom plate to be shifted in relation to the pair of rollers for cleaning of at least said plates.

8. The device of claim 7, wherein said first piston cylinder means moves the top and bottom plates of said compartment horizontally out of said operating position.

9. The device of claim 7, in which the entire compression compartment formed by the two top and bottom plates can be shifted in relation to the pair of rollers.

10. The device of claim 7, in which at least the bottom plate can be translatory shifted in a perpendicular direction to the plane formed by the axes of the rollers.

11. The device of claim 10, in which at least the bottom plate is supported in a slide assembly which is of dovetail design.

12. The device of claim 10, in which at least the bottom plate is equipped with an adjusting unit which rests upon the stationary part of a bearing support.

13. The device of claim 7, in which at least one of said top and bottom plates is equipped with a guide plate which is mounted to the plate turned away from the compression compartments and which extends with a rail between two arms of a support member, said arms being preferably spring-mounted to each other.

14. The device of claim 13, in which the arms are connected with each other by clamping devices.

15. The device of claim 13 wherein said first piston cylinder means has a piston pivotally mounted to the rail of the guide plate.

16. The device of claim 15, in which the piston has a hinge connection located on the rail between two clamping units mounted transversely to the rail.

17. The device of claim 15, in which each piston cylinder means is inclined in relation to its associated box plate.

18. The device of claim 13 further comprising a side bracket which holds each plate in its operating position and is swivelable around the axis of the respective roller, said side bracket being equipped with two pivotally connected arms upon the free ends of which rests a guide plate for the other plate forming the compression compartment, said guide plate being shiftable.

19. In a device for crimping groups of textile filaments comprising a pair of opposing rollers disposed one above the other, one of said rollers being mounted in a stationary manner and the other of said rollers being swivelably mounted, a compression compartment comprising a swivelable plate and a plate which is stationary in operation and connected to side plates, said compression compartment being operatively associated with the nip of the rollers on one side of said rollers for receiving filaments therefrom, means operatively associated with the plates of the compression compartment for moving the plates of said compartment out of operating position and other means operatively associated with the rollers for pressing the other of said rollers against said one roller, the improvement which comprises bearings for at least one of the rollers being embraced by a separate bearing ring which in turn is fixed to a pedestal support.

20. The device of claim 19, in which one of the compression compartment plates is swivelable around the axis of one of the rollers by a side bracket, the side bracket being mounted to a separate bearing ring which in its turn embraces a bearing of the roller.

21. The device of claim 19, in which the rollers are supported in the pedestal support without any axial play by a play-free bearing.

22. In a device for crimping groups of textile filaments comprising a pair of opposing rollers disposed one above the other, one of said rollers being mounted in a stationary manner and the other of said rollers being swivelably mounted, a compression compartment comprising a swivelable plate and a plate which is stationary in operation and connected to side plates, said compression compartment being operatively associated with the nip of the rollers on one side of said rollers for receiving filaments therefrom, means operatively associated with the plates of the compression compartment for moving the plates of said compartment out of operating position and other means operatively associated with the rollers for pressing the other of said rollers against said one roller, the improvement which comprises lateral compression compartment walls provided with thrust washers located level with

the nip of the rollers, said washers bearing against outer sections of the roller faces and being revolved parallel to the axes of the rollers.

23. The device of claim **22,** in which the rotational axis of the thrust washer is excentrically located at a certain distance from the nip of the rollers.

24. The device of claim **22,** in which the thrust washer revolves continuously.

25. The device of claim **24,** in which an automatically operating adjusting element acts on the thrust washer.

26. The device of claim **25,** in which the adjusting element acts on the circumference of the thrust washer.

27. The device of claim **26,** in which teeth with a diameter smaller than that of the thrust washer are provided for engagement with the adjusting element.

28. The device of claim **25,** in which the adjusting element is mounted to a recess in the respective side plate.

29. The device of claim **25,** in which the adjusting element is a piston cylinder means, the free end of the piston in said means being provided with an adjusting head which engages with the teeth on the thrust washer.

30. The device of claim **29,** in which the adjusting head is swivelable around a hinge in the piston.

31. The device of claim **22,** in which said piston of the piston cylinder means acts on the thrust washer and thereby exerts a pressure on said thrust washer.

32. The device of claim **31,** in which the pressure is maintained constant by means of a valve.

33. The device of claim **32,** in which the valve is designed as a nonreturn valve.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,800,373

DATED : April 2, 1974

INVENTOR(S) : Heinz FLEISSNER

It is certified that error appears in the above—identified patent and that said Letters Patent is hereby corrected as shown below:

In column 18, at lines 10, 11 and 12:

"31. The device of claim 22, in which said piston of the piston cylinder means acts on the thrust washer and thereby exerts a pressure on said thrust washer."

should read:

--31. The device of claim 22, in which a piston of a piston cylinder means acts on the thrust washer and thereby exerts a pressure on said thrust washer.--

Signed and Sealed this

Thirty-first Day of *May 1983*

[SEAL]

Attest:

DONALD J. QUIGG

Attesting Officer *Acting Commissioner of Patents and Trademarks*