April 15, 1958 R. WILDBOLZ 2,830,327

DRAFTING FRAME

Filed July 10, 1953 2 Sheets-Sheet 1

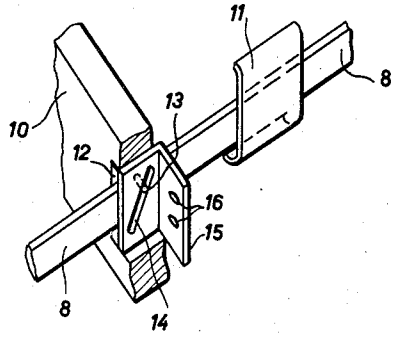
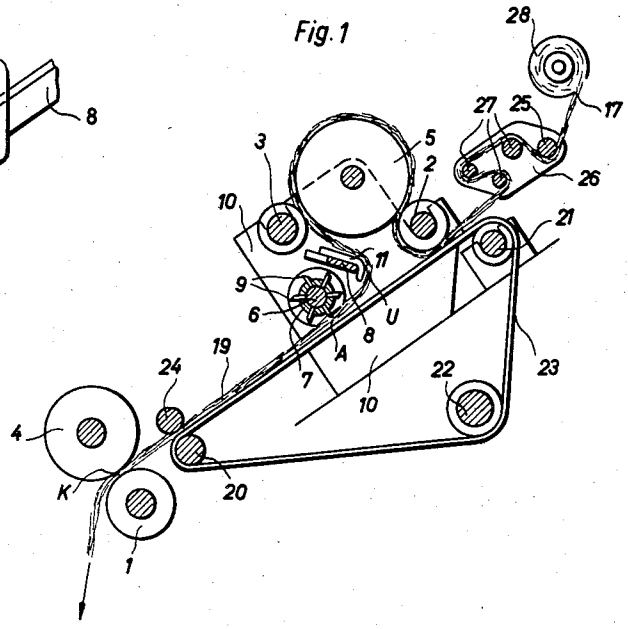


Fig. 2

Fig. 1



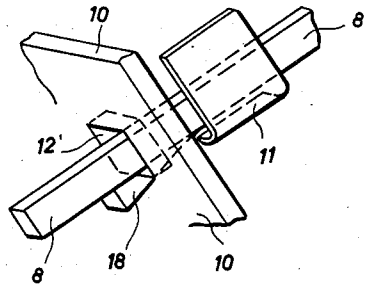
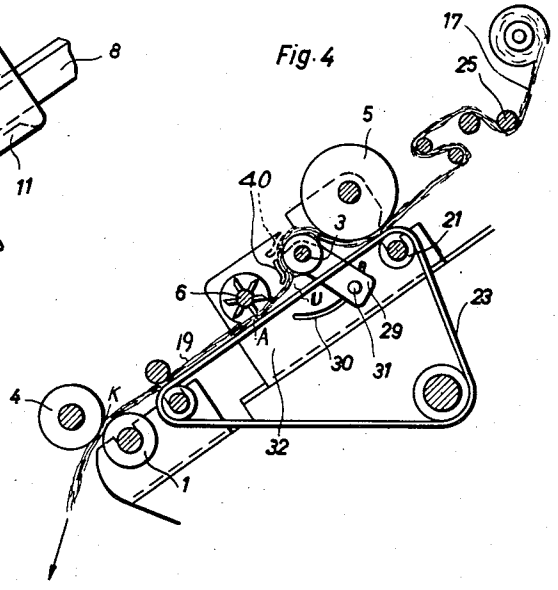


Fig. 3

Fig. 4



INVENTOR.
RUDOLF WILDBOLZ.
BY
K. B. Mayr.
ATTORNEY.

April 15, 1958 R. WILDBOLZ 2,830,327

DRAFTING FRAME

Filed July 10, 1953 2 Sheets-Sheet 2

Fig. 5

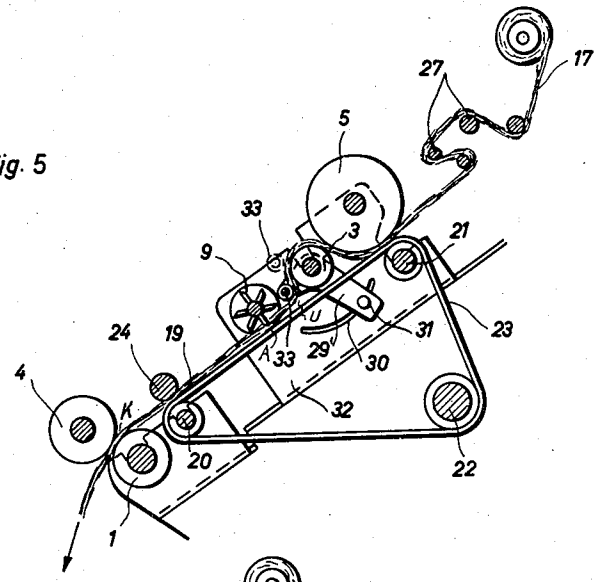


Fig. 6

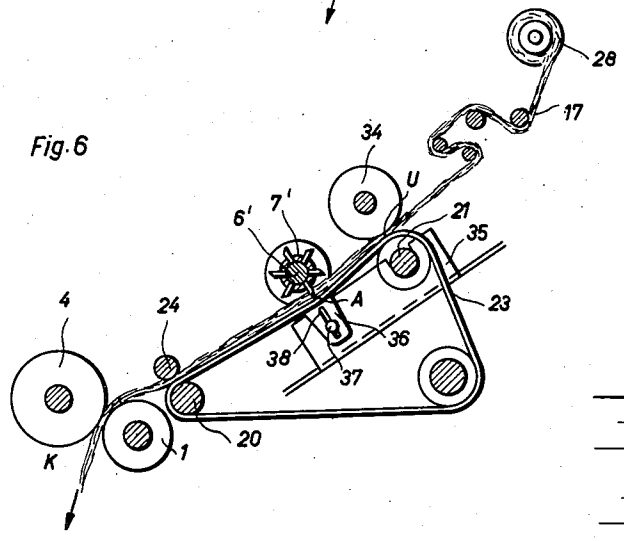
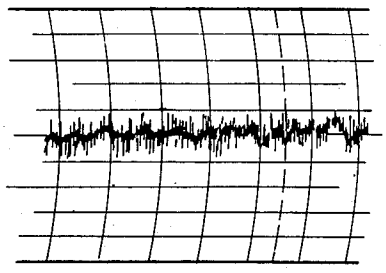


Fig. 8



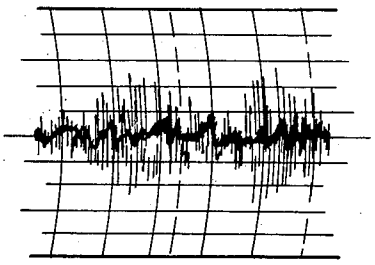


Fig. 7

INVENTOR.
RUDOLF WILDBOLZ.
BY
K. B. Mayer
ATTORNEY.

United States Patent Office

2,830,327

Patented Apr. 15, 1958

2,830,327

DRAFTING FRAME

Rudolf Wildbolz, Winterthur, Switzerland, assignor to Joh. Jacob Rieter & Co., Ltd., Winterthur, Switzerland, a corporation of Switzerland

Application July 10, 1953, Serial No. 367,281

Claims priority, application Switzerland July 28, 1952

5 Claims. (Cl. 19—.6)

The present invention relates to the direct production of thread or yarn from a bundle of endless filaments.

According to a conventional method, staple fibre yarns are produced from filaments by tearing and drafting between two pairs of rollers. However, the staple produced in this manner is irregular; it varies between the length of the tearing field and zero. Such yarns and fabrics produced therefrom shrink during finishing operations because of excessive elongation during the tearing process, which is undesired with certain fabrics.

In order to overcome these difficulties, it has been proposed to assist breaking of the fibres in the filament bundle between the clamping roller pairs by providing special devices in the drafting frame. These devices operate according to the principle of sharply diverting the moving filament bundle from its straight course in the drafting frame in order to break the filaments at the point of diversion by an edging effect, depending on the gripping action of the front roller, at much less tension than when breaking the filaments by a pure tearing process. Staple fibre yarns produced in this manner have much less ability to shrink and have a more uniform staple than yarns produced by a pure tearing effect.

Numerous tests have shown that the filament ribbons or tows to be spun behave differently during the breaking process depending on the material, manufacture, and avivage. Whereas some tows produce faultless yarns at a certain diversion by the cutting or breaking means, characterized hereafter by the breaking angle, the longitudinal stepping of the broken individual fibres is unsatisfactory with the same drafting frame arrangement. At a sharp deflection of the filament ribbon, i. e. at a small breaking angle, little tension is needed to break the filaments at the point of diversion. The staple obtained in this manner is extremely uniform but there is the danger of breaking the filaments in packs. Responsible for this are, besides the reasons already mentioned, circumstances depending on the condition of the incoming ribbon, for example periodic changes of the titre, twisted, crossing, or cohering filaments. Since, whenever a whole filament pack is broken, a period of time elapses, which is exactly defined by the draft in the drafting frame, until the simultaneously broken filaments are gripped by the front roller and are again simultaneously broken, a thread is produced whose cross section changes periodically.

If one operates with a greater breaking angle, i. e. with less diversion of the tow at the breaking device, a greater tension is needed in order to break the individual filaments. Changes of the ductility and of the sensitivity to crushing of the individual filaments in the tow have therefore a much greater effect, causing a greater percentage of filaments to break outside of the point of diversion at the breaking device because of the great breaking elongation and the greater stress. The produced staple is therefore not as uniform as at a smaller break angle, however, it is of much better quality than that produced by the pure tearing process. Periodic

changes of the cross section of the yarn, which may be caused by breaking the filaments in packs, disappear quickly, because the breaking zone is not exactly localized at the diversion point. However, the shrinkability of the produced thread increases.

It is evident from the above that the provisions to be made for treating a spinning cable in a drawing frame comprising a breaking device, considering the tearing force, uniformity and shrinkability of the staple fibre yarn, partly contradict each other.

Great tearing force, i. e. uniform staple and little shrinkability call for small break angles, i. e. a sharp diversion of the filament ribbon at the breaking device. With this arrangement the danger of breaking whole filament packs increases, impairing uniformity of the yarn.

On the other hand, the staple becomes less uniform and the tearing force is less at a great break angle. This, however, makes the end product less uniform.

The drafting frame according to the invention overcomes these difficulties by providing means for changing the breaking angle of the filament bundle at the breaking device without changing the distance of the breaking device from the front roller pair. Adjustability of the breaking angle is preferably effected by means of a guide rail whose position can be changed.

The drafting frame according to the invention can be adjusted to produce a staple fibre yarn of a desired quality, depending on the material, manufacture and avivage of the tows.

The invention is illustrated, by way of example, in the accompanying drawing in which

Fig. 1 is a schematic sectional view of a breaker drafting frame.

Figs. 2 and 3 are perspective illustrations of two modifications of a detail of the drafting frame shown in Fig. 1.

Figs. 4 to 6 are schematic sectional views of three modified breaker drafting frames according to the invention.

Fig. 7 is a uniformity diagram of a faulty staple fibre yarn.

Fig. 8 is a uniformity diagram of a staple fibre yarn produced on a breaker drafting frame according to the invention.

Like parts are designated by like numerals in different figures of the drawing.

Referring more particularly to Fig. 1 of the drawing, the breaker drafting frame comprises front and rear bottom cylinders 1, 2, 3 on which rest top rollers 4 and 5 provided with an elastic covering. The circumferential speed of the cylinders 1 and 2, 3 corresponds to the desired draft. The front top roller 4 is provided with pressure means, not shown, the back top roller acting by its weight. A shaft 6 carrying a knife roller 7 is placed below cylinder 3. A diverting rail 8 is arranged above the shaft 6. The knives of the rollers 7 have edges 9 which are rearwardly inclined with respect to the direction of their movement. The circumferential speed of the knife edges is greater than that of the delivery rollers 1, 4. Gliding of the filaments on the edges 9 has a continuous sharpening effect. The shaft 6 and the diverting rail 8 extend over the whole machine and are supported by the bearing shields for the cylinders 2 and 3. The rail 8 is provided with polished diverting plates 11 for diverting the tows. A single plate extending across the whole system may be provided instead of individual plates.

Figure 2 is a detail illustration of the support of the diverting rail 8. The bearing shields 10 are provided with slots 12 in which the rails 8 are slidable. The latter are provided with pins 13 extending into inclined slots 14

of angle irons 15 which extend into the slots 12 and which are bolted to the bearing shield 10 (see holes 16). The angle irons 15 limit the lateral play of the rails 8 in the slots 12. A polished diverting plate 11 is provided on the rail 8 for each spinning unit for supporting and diverting the tow 17.

Fig. 3 illustrates a modification of the support of the diverting rail 8. The bearing shields 10 are provided with slots 12' in which the rail 8 is movably guided and positioned by wedges 18 affording changing the elevation of the rail. A polished diverting plate 11 for diverting and supporting the tow 17 is provided on the rail for each spinning unit.

A belt 23 supports the broken staples 19 within the drafting field. The belt is laid around the cylinders 20, 21 and the tensioning roller 22, one or more slip rollers 24 rotating on the belt. A rod 25 is placed at the inlet of the drafting frame and extends over the whole machine, the rod carrying plates 26 provided with thread spreading pins 27, each pin extending over two spinning units. Numeral 28 designates a tow bobbin from which the tow 17 runs into the drafting frame.

For starting operation of the drafting frame, the end of the tow 17 is pulled from the bobbin 28 and fibrillated so that the individual ends of the filaments are uniformly staggered in the tow. This may be done by means of sand paper. Thereupon the so prepared end of the tow is laid around the rod 25 and the spreading pins 27, as well as around the cylinders 2 and 5 whereupon the tow enters the drawing field from the nip of the cylinders 3 and 5. The end of the tow passes over the diverting plate 11 and under the knife roller 7 and thereupon, supported and guided by means of the belt 23 and the slip roller 24, into the nip K of the rollers 1 and 4. The breaking device 7 rotates in the direction of the movement of the filaments. The belt 23 is driven in the same direction and so that it moves at least 10% faster than the circumferential speed of the rear cylinder 3. Ends of filaments which project from the tow are thereby continuously straightened. As soon as individual filaments of the tow 17 reach the nip K, they are tensioned according to the adjusted draft and are deflected exactly at the edges 9 of the knife roller 7. The extent of the deflection of the filaments is defined by the breaking angle, i. e. the angle formed by the line connecting the point of deflection A at an edge 9 and the nip K, and the line connecting point A and the diverting point U at the diverting plate 11. Upon reaching breaking stress, the filaments break at the most stressed point, because of edging at point A, and are pulled as staple fibres 19 by the front cylinder pair 1, 4 and are subsequently spun by twisting means, not shown. For the reasons explained at the beginning of this specification not every tow can be worked without fault and at best operating conditions at the same breaking angle. The most suitable angle must be found by experiment. This is preferably done, for example, by pulling the diverting rail 8 (Fig. 3) at first to its extreme right position whereby the rail with its diverting plates 11 is moved into its most elevated position by the illustrated means. In this position the breaking angle KAU is smallest and a little shrinkable and uniformly stapled yarn is produced because of insignificant overtensioning of the staples. If examination in a uniformity testing machine reveals periodic changes of the cross section of the yarn, the diverting rail 8 must be pushed somewhat to the left, i. e. lowered so that the breaking angle is enlarged. Fig. 7 shows a characteristic example of excessive variations. The aforedescribed correction, however, makes the staples less uniform and makes the produced yarn more shrinkable. If a second examination shows that a uniform yarn, free of periodic changes (Fig. 8), is produced, production can be started on the machine, otherwise a second adjustment must be made in the same direction.

The drafting frame according to the invention cannot only be adapted to the available tow, but can also be adjusted to control shrinkability of the yarns produced from certain materials, within wide limits, depending on the intended use of the yarns.

In contradistinction to the arrangement according to Fig. 1, the back top roller 5 of the drawing frame shown in Fig. 4 rests on the cylinder 3 and on the belt cylinder 21. The longitudinally movable diverting rail 8 is replaced by a diverting rail or plate member 40 which is swingable transversely to its longitudinal axis. The diverting rail extends over the length of a whole system and has at each end a swing arm 29 which arms are supported by the cylinder 3 and serve for moving the diverting rail for a certain distance around the cylinder axis. The position of the diverting rail for producing the smallest breaking angle is shown in dotted lines in Fig. 4. The arms 29 can be fixed in the desired position by tightening bolts 31 which extend through an arcuate slot 30 in the bearing block 32.

A third modification of the drafting frame is shown in Fig. 5. A diverting roller 33 supported by swing levers 29' is provided instead of the diverting rail 40 of Fig. 4. The mechanism for positioning the diverting roller is the same as that for positioning the rail 40 in Fig. 4.

Starting and operation of the drawing frames according to Figs. 4 and 5 is the same as that of the drawing frame shown in Fig. 1. In order to change the breaking angle KAU, the bolts 31 of each system are loosened and the swing arms 29 or 29' are moved into the position corresponding to the desired position of the diverting rail 40 or of the roller 33. Thereupon the bolts 31 are tightened.

Fig. 6 illustrates a fourth modification of the breaker drafting frame according to the invention in which the back top roll 34 forms a clamping nip with the belt cylinder 21. The purpose of the diverting means shown in Figs. 1 to 5 is achieved by changing the position of the shaft 6' for supporting the knife rollers 7' relatively to the stationary bearing block 35. The shaft 6' is supported by bearer plates 36 provided with slots 38, bolts 37 extending through the slots 38 for fixing the plates 36 to the blocks 35.

In order to change the breaking angle KAU, formed by the nip K of the front cylinders 1 and 4, the deflection point A at the severing means 7', and the nip U of the rear cylinders 21 and 34, the bolts 37 are loosened at all blocks 35 whereupon the bearer plates 36 for the shaft 6' can be displaced perpendicularly to the plane of the drafting frame to produce the desired breaking angle and the bolts 37 are tightened. Starting and operation of the drafting frame according to Fig. 6 is effected in the same manner as of the drafting frame shown in Fig. 1.

While I have shown and described specific embodiments of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made therein without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim:

1. A drafting frame comprising, in combination, feed rollers, delivery rollers, breaking means interposed between said feed and delivery rollers, means for holding said breaking means in a permanently unchangeable position relatively to said delivery rollers, for producing a staple fibre ribbon from a filament bundle, guide means interposed between said feed rollers and said breaking means for causing the filament bundle to enter said breaking means at a predetermined angle, and adjusting means associated with said guide means for setting said guide means to maintain said angle during the drafting operation.

2. A drafting frame as defined in claim 1, said guide means including a diverting plate member slidably supporting the filament bundle, and a rail supporting said plate member, said adjusting means being connected with

said rail and adapted to change the position of said rail relatively to said breaking means.

3. A drafting frame as defined in claim 1, said guide means including a guide roller supporting the filament bundle, a diverting plate member spaced from and placed substantially parallel to the surface of said guide roller and holding the filament bundle on said roller, said adjusting means being connected with said plate member and adapted to change the angular position of said plate member relatively to said guide roller.

4. A drafting frame as defined in claim 1, said breaking means including a belt supporting said filament bundle and a knife roller placed opposite to said belt and rotating at a circumferential speed greater than that of said delivery rollers, the edges of the knives of said knife roller being inclined rearwardly with respect to the direction of their circumferential movement for producing a stroking action on the filament bundle.

5. A drafting frame comprising, in combination, feed

rollers, delivery rollers, a belt running over said rollers, a rotary breaker placed adjacent to said belt and between said feed rollers and said delivery rollers for pressing a filament bundle against said belt and producing a staple fibre ribbon, guide means interposed between said feed rollers and said breaker for causing the filament bundle to approach said breaker at a predetermined angle, and adjusting means associated with said guide means for setting said guide means to maintain said angle during the drafting operation.

References Cited in the file of this patent

UNITED STATES PATENTS

2,221,869	Halin	Nov. 19, 1940
2,247,529	Taylor et al.	July 1, 1941
2,255,755	Bell	Sept. 16, 1941
2,273,752	Frey	Feb. 17, 1942
2,419,320	Lohrke	Apr. 22, 1947