

June 19, 1951

F. HONIG  
ART OF PRODUCING YARN  
Filed April 17, 1948

2,557,433

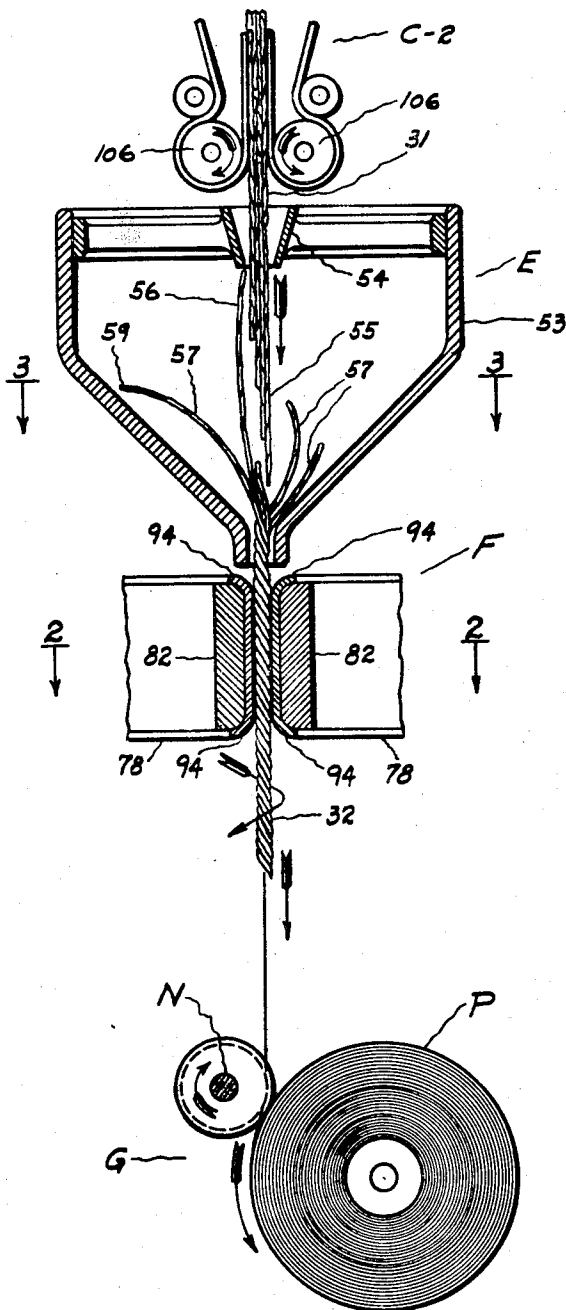


FIG. 1

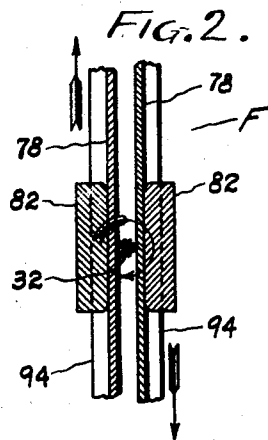


FIG. 3.

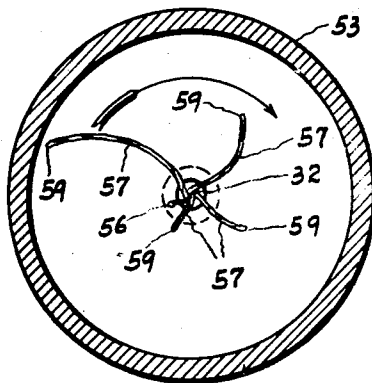
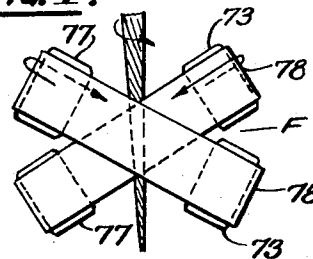


FIG. 4.



INVENTOR.  
FRANK HONIG

BY  
*Harry J. ...*  
Attys.

## UNITED STATES PATENT OFFICE

2,557,433

## ART OF PRODUCING YARN

Frank Honig, Edgewood, R. I.

Application April 17, 1948, Serial No. 21,712

2 Claims. (Cl. 57-156)

1

This invention relates to yarn and more particularly to an improved process for spinning yarn whereby harmful tensions and torsions are reduced in the finished product.

Conventionally the strength of spun yarns, strands or the like is impaired by the existence of uneven tensions of individual fibers within the strand and also by the fact that the individual fibers are subjected to internal torsions. The uneven tensions come from the fact that, as the strand is formed by spinning, the more central fibers are held tightly in contact with the fibers of the more compact center, while the fibers near the outside may slip slightly one past the other. Then as the fibers wrap around each other in the helix caused by the spinning, the fact that some have a larger radius than others and that the fibers whose ends are near the surface undergo a slight slippage contributes to a condition of uneven fiber tensions throughout the strand. This condition reduces the overall tensile strength of the strand because it leads to progressive rupture of fibers rather than simultaneous rupture which is necessary to develop the theoretical maximum tensile strength of the strand. As regards internal torsions within the fibers themselves, this is caused by the fact that, as the spinning is performed, the individual fibers are for the most part held tightly at both ends. Thus when they are twisted, they not only wrap around each other but also twist within themselves. The internal torsion caused by such twisting also reduces tensile strength and results in further reducing the ability of the strand to approximate its theoretical maximum tensile strength.

It is an object of my invention to provide a process for producing a strand whereby the above mentioned uneven tensions between individual fibers and the internal torsions within fibers may be virtually eliminated and a stronger strand produced thereby.

In the accomplishment of these and other objects of my invention I employ a draw frame to attenuate a roving or the like into a thin, ribbon-like element. Thereafter I feed the said ribbon-like element through a confined space and twist the same as it emerges therefrom. In the confined space the said ribbon-like element undergoes substantial centrifugal action due to the twisting and this coupled with an electrostatic charge on the fibers has the effect of substantially separating the fibers and freeing their trailing ends. In this manner, the fibers converge into a composite strand merely by wrapping

2

around each other substantially without unevenness of tension one to the other or without internal torsion.

Further objects and features of my invention will best be understood and appreciated from a detailed description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a sectional diagrammatic view in side elevation of apparatus to perform the process of my invention;

Fig. 2 is a sectional plan view along the lines 2-2 of Fig. 1;

Fig. 3 is a sectional plan view along the lines 3-3 of Fig. 1; and

Fig. 4 is a diagrammatic view in front elevation of the twisting belts.

The preferred embodiment of the process of my invention herein shown is carried out by first drafting a roving or the like into a thin, ribbon-like element indicated at 31. This may be accomplished in a conventional draw frame or in a draw frame as described in my co-pending application Serial No. 21,713, filed April 17, 1948. The discharge end of such a draw frame is indicated diagrammatically at C-2 in Fig. 1.

After leaving the draw frame, the said ribbon-like element 31 enters a forming chamber E. The chamber E comprises a bell shaped outer member 53 and a small funnel 54 situated in the large mouth of the bell member 53. The drawn element 31 first enters the funnel 54, then passes through bell member 53 under conditions to be more fully described below, and then is twisted into a strand 32 by opposed belts 78. Thereafter, it is wound onto a spool or cheese in the conventional manner as indicated at G.

For simplicity of illustration, the drawn element 31 is shown in Fig. 1 as comprising only a relatively few fibers. Thus it will be seen that said element 31 enters funnel 54, and a fiber such as indicated at 55 extends downward into bell member 53. Fiber 55 represents the lower terminus of the non-rotating part of the element 31, and its upper end will be held loosely in funnel 54. Funnel 54 is adjustable relative to bell member 53 to accommodate different fiber lengths, it being important to have the upper end of fiber 55 fairly near to the release point from funnel 54 by the time fiber 55 is caught in the rotating stream of the fibers below.

A fiber 56 is shown as being caught at its lower end in the said rotating stream and with its upper end starting to break away from the funnel 54. Other fibers indicated at 57 have progressed far-

3

ther down and have commenced to converge in the narrow throat of bell member 53. As these fibers 57 converge, they close in on the lower ends of fibers such as fiber 55 and serve to draw them through funnel 54. Also the upper ends of fibers 57 as indicated at 59 flare out and rub against the inner surface of bell member 53. This inner surface may preferably be made of hard rubber or glass and thereby generate an electrostatic charge in the fiber group as it proceeds through bell member 53.

Thus it will be seen that both through centrifugal and electrostatic forces, the upper ends of the fibers are substantially disassociated one from the other immediately prior to being formed into the strand. Then when belts 78 twist them together, they simply wrap one around the other and with their upper ends being substantially free, the internal torsions present in conventional strand fibers are not generated. Also with their upper ends being substantially free, the differences in helical radius due to twisting do not cause uneven tensions from one fiber to the next, because the fibers simply adjust to the new configuration prior to final compacting. Of course, certain of the fibers in the center of the strand may receive a slight amount of permanent torsion but since they are only lightly held by funnel 54 even this is minimized.

The belts 78 are disposed in crossed relationship as may be seen in Fig. 4, and it will be understood that the amount of twist as well as the rate of passage through chamber E may be regulated by the surface speed of said belts and their angular disposition.

Since certain variations in this preferred embodiment of my invention will be readily apparent to those skilled in the art, it is not intended to limit the invention to the precise form herein shown, but rather to measure it in terms of the appended claims.

Having thus disclosed my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. The process of twisting yarn which comprises, drafting a roving into a thin ribbon-like element under conditions wherein said element takes on an electrostatic charge, feeding said

4

ribbon-like element into a confined space having an inner surface adapted to produce like static electrical charges on fibers rubbed against it, disassociating a majority of said fibers within said confined space by electrostatic repulsion and centrifugal force withdrawing said fibers from said confined space, and simultaneously rotating the fibers as a mass while withdrawing them, whereby the individual fibers, having one free end, wrap helically about the composite yarn without receiving internal torsional stress.

2. The process of making yarn, which comprises, drafting a body of staple length fibers, feeding said body coaxially into a stationary zone, creating an electrostatic charge in said body by rubbing it while in said zone, coaxially disjoining said body within said zone by the electrostatic charge on the fibers in said body, coaxially removing the disjoined portion from said chamber while twisting it to form a yarn and substantially preserving the longitudinal disposition of said fibers as produced in said body, and winding said yarn with a substantially uniform tension into a package.

FRANK HONIG.

## REFERENCES CITED

The following references are of record in the file of this patent:

## UNITED STATES PATENTS

| Number    | Name                 | Date          |
|-----------|----------------------|---------------|
| 689,556   | Metcalf .....        | Dec. 24, 1901 |
| 778,604   | Phillips et al. .... | Dec. 27, 1904 |
| 1,126,042 | Lister .....         | Jan. 26, 1915 |
| 1,621,158 | Edelmann .....       | Mar. 15, 1927 |
| 1,724,200 | Hubbard .....        | Aug. 13, 1929 |
| 1,743,601 | Gross .....          | Jan. 14, 1930 |
| 2,103,218 | Gwaltney et al. .... | Dec. 21, 1937 |
| 2,262,589 | Peck .....           | Nov. 11, 1941 |
| 2,451,504 | Mayo .....           | Oct. 19, 1948 |
| 2,453,802 | Maxham .....         | Nov. 16, 1948 |

## FOREIGN PATENTS

| Number  | Country       | Date          |
|---------|---------------|---------------|
| 502,216 | Germany ..... | July 11, 1930 |
| 769,512 | France .....  | June 9, 1934  |
| 859,187 | France .....  | June 3, 1940  |