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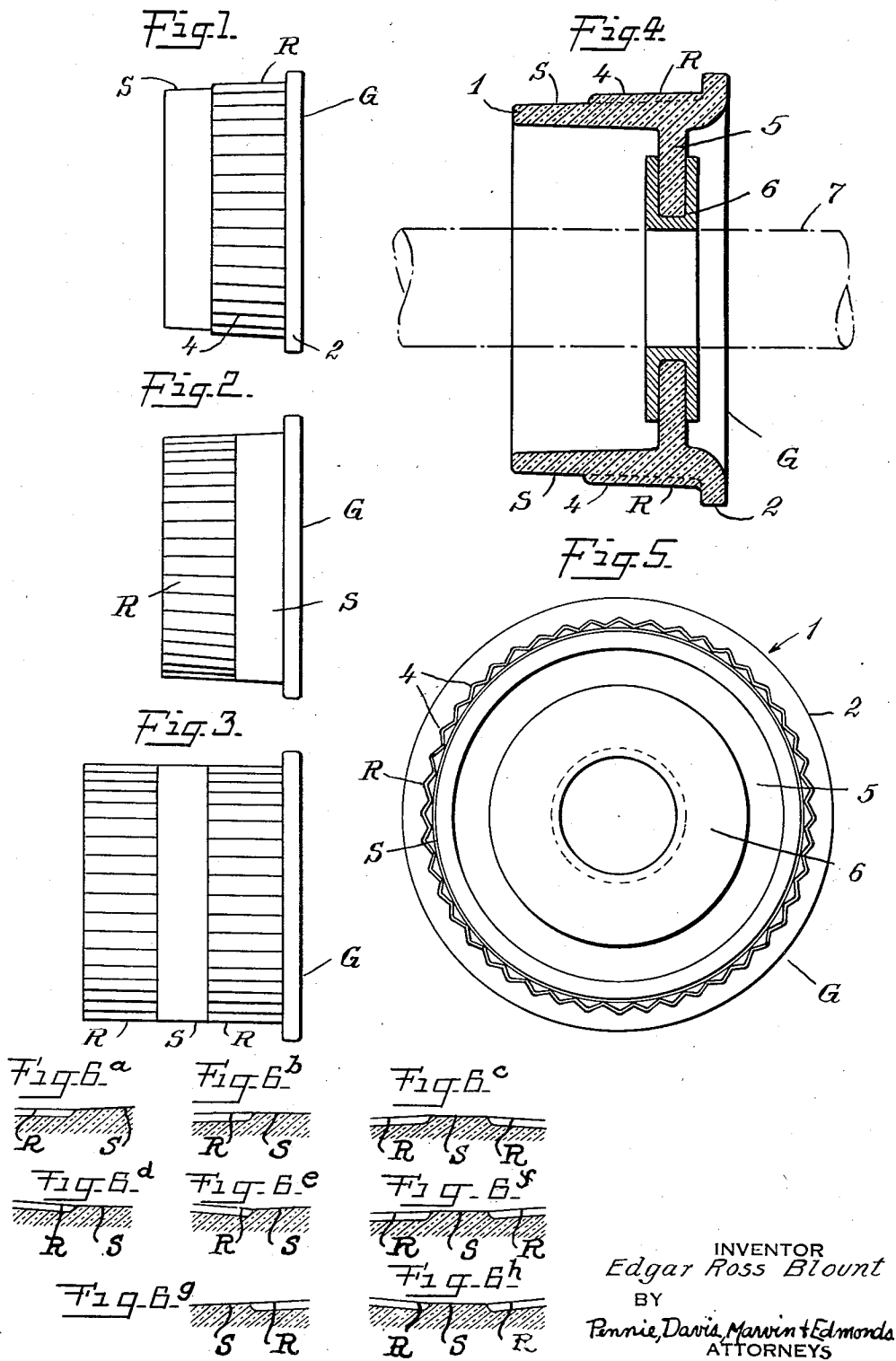
E. R. BLOUNT

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DUPLEX SURFACE GODET AND SPINNING APPARATUS

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2 Sheets-Sheet 1



INVENTOR
Edgar Ross Blount
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

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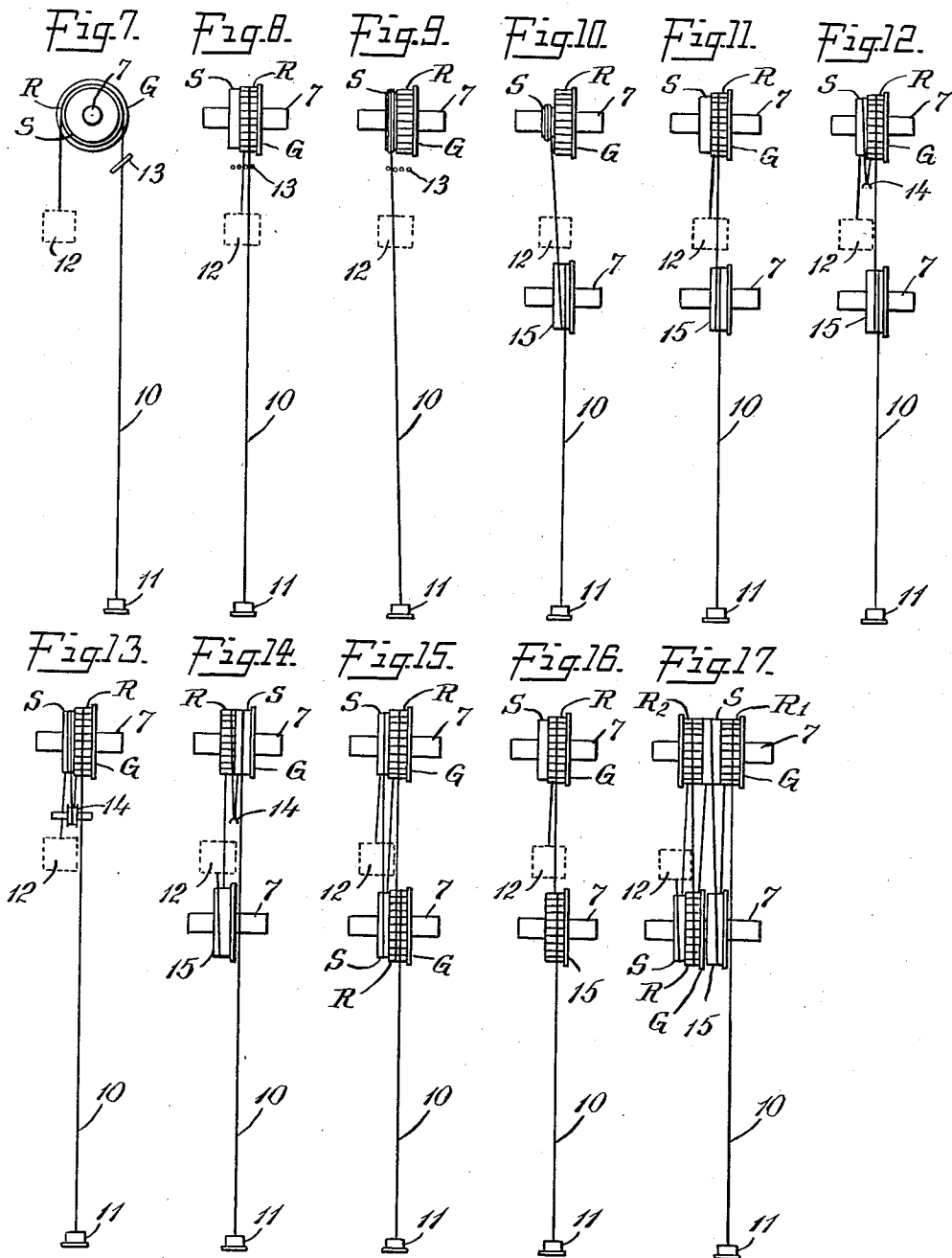
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INVENTOR
Edgar Ross Blount
BY

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ATTORNEYS

UNITED STATES PATENT OFFICE

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DUPLEX SURFACE GODET AND SPINNING APPARATUS

Edgar Ross Blount, Rome, Ga., assignor to Tubize Chatillon Corporation, New York, N. Y., a corporation of Delaware

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10 Claims. (Cl. 18—8)

This invention relates to the manufacture of rayon thread, and more particularly to the control of the tension of the thread at one or more stages in its travel from a spinneret to a collecting device.

One of the objects of the invention is to provide an improved drawing wheel or pulley (hereinafter called a godet). The improved godet of the invention is a unitary structure having a plurality of contiguous thread-contacting surfaces at least one of which is smooth and at least one of which has longitudinal peripheral ridges. The godet is adapted to be mounted upon a shaft, and to be driven by the shaft or to turn freely thereon. The invention also contemplates various combinations of the unitary godet, and combinations thereof with conventional godets, drawing wheels, pulleys or guides in various spinning "hook-ups". The invention further contemplates an improved method of controlled tension spinning characterized by passing the rayon thread over one or more surfaces of the improved godet of the invention, in various combinations with similar or other forms of godets to effect such controlled stretching or contracting of the thread as may be required to impart the desired titer and other qualities to the finished thread.

The thread-contacting surfaces of the godet of the invention may be cylindrical or frusto-conical, or may include various combinations of such, and other configurations, depending upon the particular effect or effects which it is desired to produce upon the thread. The godet of the invention may be used in various spinning operations involving the stretching or contracting of thread, the accumulation of thread during doffing and other spinning methods and practices for the facilitation of spinning and the improvement of the thread. The thread may be progressively stretched or permitted to contract at desired stages in the spinning process by utilizing the different drawing effects of the smooth and ridged surfaces of the godet, thereby producing a thread having improved tensile strength, as well as improved uniformity of tensile strength, denier and dyeing properties.

The invention is applicable to the tension spinning of rayon filaments, thread or the like, especially as produced by the viscose process, but may also be used in the spinning of thread produced by the cellulose acetate, cellulose ether, cuprammonium or nitrocellulose processes.

These and other features of the invention will be better understood from the following discus-

sion taken in conjunction with the accompanying drawings, in which

Figs. 1, 2 and 3 illustrate godets embodying the features of the invention;

Fig. 4 is a longitudinal cross section of the godet of Fig. 1;

Fig. 5 is a front end elevation of the godet of Fig. 1;

Figs. 6a, 6b, 6c, 6d, 6e, 6f, 6g, and 6h show a number of sectional fragmentary views of the contours of the thread-contacting surfaces of godets embodying the invention;

Figs. 7, 8 and 9 are diagrammatic front and side views of the godet of the invention in a simple spinning operation;

Figs. 10 to 17 are diagrammatic side views of various applications of the godet of the invention in the tension spinning of rayon.

The godet G of the invention is a unitary structure, preferably formed of a single piece of material such as glass, porcelain, corrosive-resistant alloys or the like, and comprises a body portion 1, having a plurality of thread-contacting contiguous surfaces at least one of which is a longitudinally ridged surface R and at least one of which is a smooth surface S, and a flange 2 at one end of the body portion and extending circumferentially therefrom. The ridges 4 extend in the longitudinal direction of the godet, are on the exterior or peripheral part of the surface, and the outermost or thread-contacting parts thereof are sufficiently fine or narrow to present a relatively small surface of contact to the thread. The ridges may be in any suitable form and in a godet five inches in diameter, for example, about fifty ridges give very good results. Thread does not adhere to such a ridged surface to the same extent that it does to a smooth surface of the same diameter. The surface S herein called "smooth" includes any uniform surface, for example, a very smooth surface such as that of cast glass or polished metal, or a less smooth surface, such as that of etched glass or metal or a sand-blasted surface.

The godet G is provided with a suitable shaft-engaging means. In its simplest form this may be merely a longitudinal hole in the center of the body portion. When the godet is made of glass, porcelain or the like, it is more advantageous to construct the body portion with an inwardly extending hub-web 5 to which a metal hub 6 is attached, as shown in Fig. 4. In constructing the godet of such molded material as glass, the metal hub is preferably placed in a suitable mold and the glass, or the like, is cast

so that the hub is securely attached to the hub-web. In the construction shown in Fig 4, the metal hub 6 has a peripheral and circumferential slot into which the glass, or the like, is forced during casting to form the hub-web 5. The godet G is mounted upon a shaft 7 and may be freely rotatable thereon, as when the godet is used as a pulley, or it may be fixed to the shaft, as by a key, when the godet is to be driven by the shaft as a true godet or drawing wheel. It is to be understood that the inner part of the godet may be formed in various ways, and its mounting upon a shaft may be arranged to meet the particular exigencies of the installation. The drawings merely illustrate, by way of example, one satisfactory construction and mounting of the godet.

For convenience, the flanged-end of the godet will be referred to as the back end and the opposite end as the front end. The thread-contacting surfaces may be cylindrical, or conical or sloped, depending upon the manner in which the godet is to be used. The conical or sloped surface is particularly advantageous when more than one loop of thread is made over the same surface, since the loops are thereby prevented from tracking one over the other and becoming entangled.

The thread-contacting surfaces of the godets shown in Figs. 1, 2, 4 and 5 slope from the back ends to the front ends, and the diameters of the smooth surfaces are different from the diameters of the ridged surfaces. The godet of Fig. 3 has one smooth surface between two ridged surfaces, all of the same diameter, and each surface is cylindrical. The contours of the thread-contacting surfaces R and S of the sections of godets shown in Figs. 6a, 6b, 6c, 6d, 6e, 6f, 6g, and 6h slope in various ways, and godets having such surfaces may be used for various purposes and in various combinations as will be more fully described hereinafter.

In Figs. 7 to 17, inclusive, the godet G of the invention is illustrated in various spinning operations or "hook-ups". In each of these figures the rayon thread 10 (comprising a group of filaments) is extruded from a nozzle or spinneret 11, and is looped over or passed around the godet G in the course of its travel to a suitable collecting device 12, such as a bobbin, pot or the like. The thread may be guided onto the surface of the godet by a fixed guide 13 (Figs. 7, 8 and 9), and it may be passed around guides 14 (shown as a rod guide in Figs. 12 and 14 and a roller in Fig. 13), or over plain or ridged pulleys or drawing wheels 15 in the course of its travel between the spinneret and the collecting device. Each of the godets G and the pulleys or drawing wheels 15 is mounted on a suitable shaft 7 to which it may be rigidly attached and driven by the shaft, or mounted to be freely rotatable thereon.

Figs. 7, 8 and 9 show bobbin or pot spinning operations in which the thread (from the spinneret 11) is looped over the ridged surface R of the godet G and then travels to the bobbin or pot 12. The godet G has a smooth thread-contacting surface S of smaller diameter than the ridged thread-contacting surface R. The thread is looped over the ridged surface R during the spinning operation (Fig. 8) and is transferred to the smooth surface S for the doffing operation, i. e., when it is necessary to replace the full bobbin or pot with an empty one (Fig. 9). The thread when transferred to the surface S is permitted to accumulate during the doffing period, at the end of which time it is manually broken

and again looped around the ridged surface R and the accumulated waste thread is pulled or pushed off the smooth surfaces in preparation for the next doffing. In the apparatus of Figs. 7, 8 and 9, there is no stretching of the thread, the thread being merely subjected to the usual draft to give it the desired titer.

In the arrangement or "hook-up" shown in Figs. 10 and 11, a stretch-spinning operation is carried out by means of a godet G and a smooth-surfaced conventional godet or a drawing wheel 15. In Fig. 10 the smooth surface S is of considerably smaller diameter than the ridged surface R and is used as a waste receiver during doffing. In Fig. 11 the godet G is similar to that of Figs. 1, 2 and 4, and the smooth surface S is also used for doffing but in instances where greater tension is required on the thread during doffing than when the godet G of Fig. 10 is used. The thread is passed from the spinneret directly to the drawing wheel 15 around which it is given one complete loop and then looped over the ridged surface R of the godet G from which it is passed directly to the collecting device 12. Both the godet G and wheel 15 are positively driven (keyed to power driven shafts), but the surfaces S and R travel at higher peripheral speeds than the surface of wheel 15 and while the difference in speed may be such that there is considerable slippage on surface R, there is, nevertheless, an accompanying controlled stretching of the thread. In the tension spinning operation carried out with this "hook-up", the thread is drawn from the spinneret under constant, positive tension by means of the conventional godet or drawing wheel 15 by reason of the fact that the thread is in substantially non-slipping contact therewith. The thread passes from the wheel 15 to godet G and is given one loop over surface R from which it is passed to the receiver 12. The peripheral speed of surface R is greater than the peripheral speed of the wheel 15 and may be from 20 to 40 percent greater. This difference in speed results in slippage on the surface R but there is an accompanying pull on the thread which causes it to stretch. During the doffing period the thread is shifted from the surface R as shown in Fig. 11 to the surface S as shown in Fig. 10 where it is permitted to accumulate. In the "hook-up" of either Fig. 10 or Fig. 11, the wheel 15 may be used as a drawing wheel as just described, or as a free running pulley in which case the drawing is done by the godet G.

Fig. 12 shows a tension spinning operation in which the thread is passed directly from the spinneret and looped completely around the constant speed drawing wheel 15 which effects a constant withdrawal of the thread from the spinneret. The thread is then looped over the ridged surface R of the godet G which is rotating at a higher peripheral speed than the wheel 15, and is then passed around the guide 14 and then looped over the smooth surface S of the godet G from which it is passed to the collecting device 12. In this operation the thread is subjected to controlled stretching between surface R and the wheel 15, and to further stretching between the guide 14 and the smooth surface S.

Fig. 13 shows an adaptation of the godet of the invention to tension spinning in which the thread is drawn directly from the spinneret by the godet G. In this method of stretching, the thread is passed a considerable distance from the spinneret before it is looped over the ridged surface R. The thread is then passed from the

surface R around a guide 14, and is then given one complete loop about the smooth surface S, from which it is passed to the collecting device 12. In this operation, the plastic thread is subjected to low tension stretching and the partially or completely solidified thread is subjected to high tension stretching.

In the adaptation of the godet of the invention to the tension stretching operation illustrated in Fig. 14, the thread is passed from the spinneret and looped over surface S of godet G. By reason of the relatively nonslipping contact of the thread with the smooth surface S, freshly spun thread is drawn out to the desired degree. The thread is then passed around the guide 14 and looped over surface R. It is then looped over the wheel 15 and then passed to the collecting device 12. In this operation, the thread is subjected to a rather mild stretching action while in a plastic state, in its passage between surface S, guide 14 and surface R. By the time the thread reaches wheel 15 it is fairly well solidified and may be subjected to increased tension or permitted to contract. The more or less solidified thread may be passed over a wheel 15 which has a higher peripheral speed than surface R and thereby effects an increased tension with some stretching, or the peripheral speed of wheel 15 may be lower, in which case the thread contracts.

Fig. 15 shows a combination of godets and a method of tension spinning in which two godets of the invention are employed. Each godet is power driven and the upper godet is driven at a higher peripheral speed than the lower godet. The thread is passed directly from the spinneret and completely around surface R of the lower godet G and is then looped over surface R of the upper godet G, from which it is looped successively over surfaces S of each godet and then passed to the collecting device 12. This use of the godets of the invention, in the operation described, makes possible controlled low tension stretching and high tension stretching. The thread is given a rather mild stretching between the surfaces R because of the slippage which may take place on the surface R of the upper godet. By the time the thread is passed over the surface S of the lower godet, it is fairly well solidified and may be subjected to considerable tension by reason of the relatively low slippage in passing over the surface S of the upper godet.

In Fig. 16 the godet of the invention G is used in combination with a conventional corrugated godet or drawing wheel 15. The method there illustrated is one in which the thread is subject to low tension stretching and is not excessively stretched at any point between the spinneret and the collecting device. This low tension stretching is effected by passing the thread from the wheel or godet 15 over only the surface R of the godet G, between the godet 15 and surface R where slippage may occur if the tension becomes excessive. In this arrangement, the smooth surface S of the godet G is used only during doffing for collecting the thread.

Fig. 17 shows a combination of a double corrugated surface godet with a single ridged surface godet and with an ordinary drawing wheel. This combination of apparatus is arranged to provide a very long thread travel and to subject the thread to different degrees of stretching and tension in its travel from the spinneret to the collecting device. In the tension spinning operation here illustrated, the thread is passed

from the spinneret and then successively looped over surface R₁ of the upper godet G, drawing wheel 15, surface S of the upper godet, surface R of the lower godet G, surface R₂ of the upper godet G, surface S of the lower godet G, and is then passed to the collecting device.

Instead of the "hook-up" shown in the arrangement of Fig. 17, the thread may be passed from the spinneret and looped completely around wheel 15, then looped successively over surface R₁, over surface R of the lower godet G, over surface S of the upper godet G, over the smooth surface S of the lower godet G, and then over the surface R₂ from which it is passed to the collecting device. In this "hook-up" the drawing is done by the wheel 15 and the thread is not subjected to appreciable tension until the filaments are relatively well solidified.

The ridged surfaces of the godets G and the drawing wheels 15 shown in Figs. 10, 11, 12 and 14 to 17 are preferably of the same diameters, and are mounted upon and driven by shafts rotating at different speeds as hereinbefore described. The thread-contacting surfaces of the godets G as illustrated in these figures (with the exception of the upper godet of Fig. 17) are sloped from the back end towards the front end conically and the two surfaces may be a continuation of one another as shown in Fig. 2, or the smooth surface S may be stepped down to a smaller diameter, as shown in Figs. 1 and 10, for example. It is to be understood that the godets G and wheels 15 may be of different diameters and rotated in such manner as to have different peripheral speeds. The drawing wheels 15 and the godets G of the invention shown in the lower position in Figs. 14 and 17 may be mounted to turn freely upon their shafts and thereby not transmit any tension to the thread but merely serve to prolong the passage of thread from the spinneret to the collecting device and to guide or change the position of the thread as shown.

I claim:

1. An improved godet for the spinning of rayon thread comprising a smooth thread-contacting surface and a ridged thread-contacting surface which is contiguous with the smooth surface, said ridges extending in the longitudinal direction of the godet.

2. A unitary godet for the spinning of rayon thread comprising a smooth thread-contacting surface which is frusto-conical in form, and a ridged thread-contacting surface contiguous with the smooth surface, said ridges extending in the longitudinal direction of the godet.

3. A unitary godet for the spinning of rayon thread comprising a smooth thread-contacting surface, a ridged thread-contacting surface which is contiguous with and tapers in the direction of the smooth surface, and a flange at one end adjacent the ridged surface which extends outwardly beyond the ridges.

4. A unitary godet for the spinning of rayon thread comprising a plurality of thread-contacting surfaces at least one of which is smooth and at least one of which is ridged, and a flange at one end adjacent the surface having the ridges, each of said surfaces being frusto-conical and the maximum diameter being adjacent the flange.

5. A unitary godet for the spinning of rayon thread comprising a plurality of thread-contacting surfaces at least one of which is smooth and at least one of which is ridged, each surface being frusto-conical, the maximum diameter of the

smooth surface being smaller than the minimum diameter of the ridged surface, and a flange at one end adjacent the ridges extending outward beyond the ridges.

5 6. A combination with a smooth surfaced conventional godet or drawing pulley comprising a unitary godet having at least one smooth thread-contacting surface and at least one adjacent, ridged, thread-contacting surface.

10 7. A combination of apparatus for the tension spinning of rayon thread which comprises a unitary godet having a frusto-conical ridged thread-contacting surface and an adjoining smooth thread-contacting surface, and a drawing wheel 15 which is driven at a lower peripheral speed than the ridged surface, said godet and drawing wheel being so arranged that the thread in its passage from a spinneret to a collecting device may be passed around the drawing wheel and looped over 20 the godet.

20 8. Spinning apparatus comprising in combination a spinneret, a collecting device, a drawing wheel over which thread is passed from the spinneret, and a unitary godet having at least one 25 smooth thread-contacting surface and at least one ridged thread-contacting surface, said godet being mounted to be driven at a higher peripheral speed than the drawing wheel and so positioned with respect to the drawing wheel that the 30 thread may be passed from the drawing wheel and looped over the ridged surface and then passed to the collecting device.

9. Spinning apparatus comprising in combination a spinneret, a collecting device, a drawing wheel over which thread is passed from the spinneret, and a unitary godet having at least one 5 smooth thread-contacting surface and at least one ridged thread-contacting surface, said godet being mounted to be driven at a higher peripheral speed than the drawing wheel and so positioned with respect to the drawing wheel that 10 the thread may be passed from the drawing wheel and looped over the ridged surface, and a guide so positioned with respect to the godet that the thread may be passed from the ridged surface around the guide, then be looped over the smooth 15 surface and then be passed directly to the collecting device.

10. Spinning apparatus comprising in combination a spinneret, a collecting device, a unitary godet having at least one ridged thread-contacting surface and at least one smooth thread- 20 contacting surface so located with respect to the spinneret and so rotated that the thread may be looped over the ridged surface and drawn to the desired titer, a second unitary godet so positioned with respect to the first mentioned godet that the 25 thread may be successively looped over the ridged surface of the second godet, the smooth surface of the first godet, the smooth surface of the second godet and then passed to the collecting 30 device.

EDGAR ROSS BLOUNT.