July 30, 1957 A. WÜRMLI 2,800,762

APPARATUS FOR MAKING YARN PACKAGES

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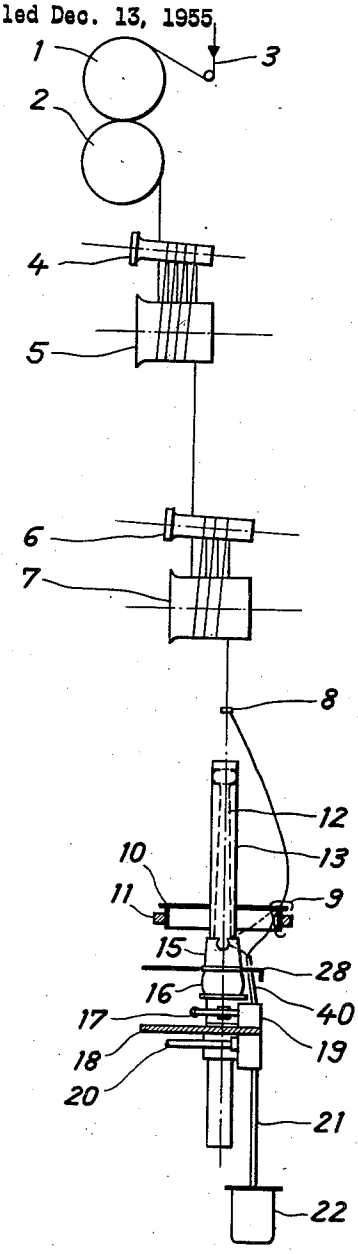


Fig. 1

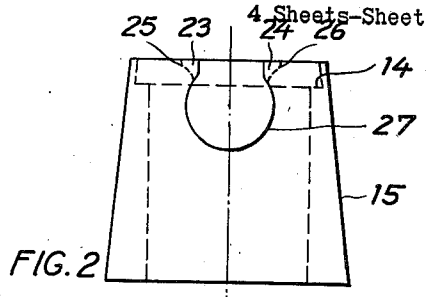


FIG. 2

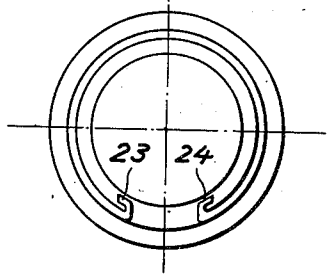


Fig. 2a

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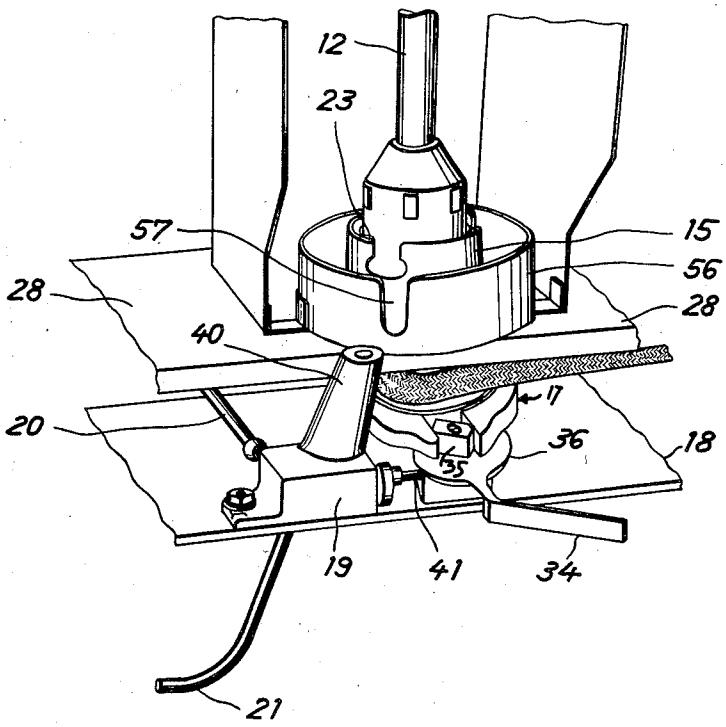
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Fig. 3



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Fig. 6

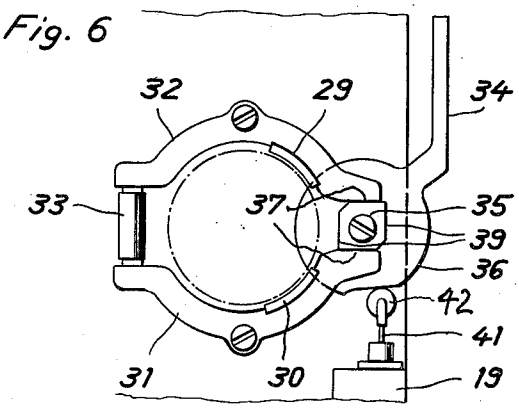


Fig. 4

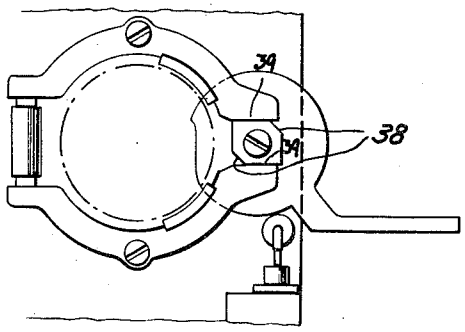
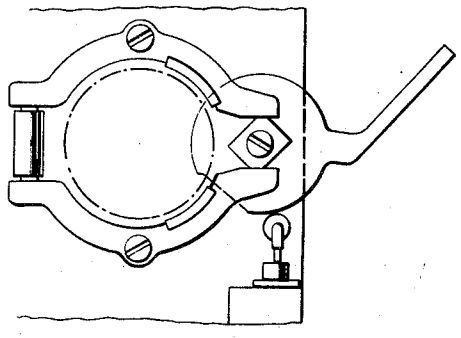


Fig. 5



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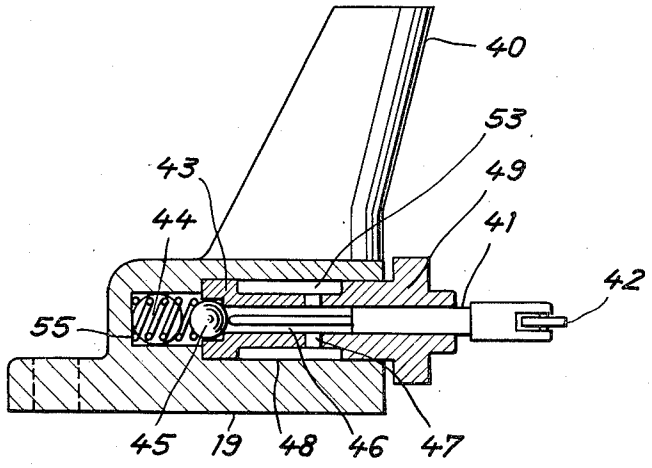


Fig. 7

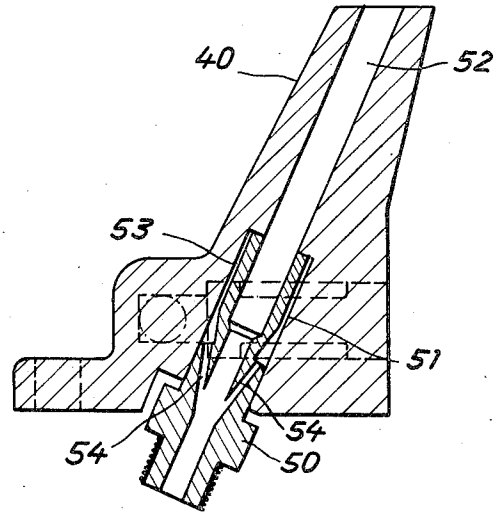


Fig. 8

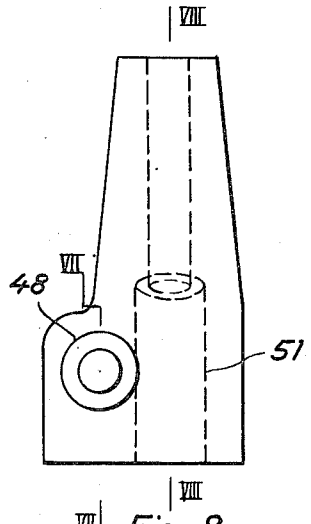


Fig. 9

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APPARATUS FOR MAKING YARN PACKAGES

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Application December 13, 1955, Serial No. 552,916

Claims priority, application Great Britain December 14, 1954

3 Claims. (Cl. 57—88)

The present invention relates to an apparatus for producing yarn packages consisting exclusively of stretched linear polymeric material.

Strands or bundles of continuous filaments of linear polymeric material collected on the winder of a conjugated spinneret must subsequently be stretched and twisted in order to increase their tensile strength. It is well known that, at the time of the initial fixing of a strand or bundle to the bobbin mounted on a twisting spindle, the strand or bundle is still in the unstretched condition and is wound on the bobbin in this condition. Not until the drawing operation is initiated by the drawing rolls which rotate at different speeds is the twisting apparatus supplied with stretched material suitable for further working. Since during the subsequent respooling, when drawing the filaments vertically from the bobbin, the protruding inner end is quite often connected with the beginning of the new spool, undesired unstretched material is necessarily transferred to the respooled packages. Removal of unstretched material necessitates an additional operation when rewinding. The rewinding operation must be interrupted and the unstretched material must be cut by the operators. It has been found that all material which is wound on the bobbin in unstretched condition at the beginning of the twisting operation is troublesome because this material is incompletely or not at all eliminated during rewinding due to the inadvertence of the operators.

To become independent of the skill and reliability of the operators it has been proposed to wind the unstretched material on a separate waste bobbin which is placed below the main bobbin or to wind it on the spindle by lowering the twisting ring. Since, normally, each spindle is individually started without arresting the other spindles the aforesaid method requires a twisting ring which is adapted to be moved downwards out of the ring rail or the ring rail must be divided for individual downward movement of the twisting rings. This necessitates a complicated mechanism, aside from the fact that the unstretched material must be periodically removed from the waste spools or spindles which means an additional operation.

Vacuum suction means have been used in the production of thread from synthetic filaments, for example, as described in the British Patent No. 359,627.

The decisive inadequacy of the vacuum-operated devices resides in the fact that with a static pressure of only a 70 mm. to 150 mm. column of water which is usually available in a pneumatic thread suction device, the friction force produced by the airstream on the relatively short portion of the thread cannot generate a thread tension of approximately 50 grammes. This force is absolutely necessary for placing the filament bundle on the drawing rolls when working materials of heavy titres.

It is an object of the invention to provide an apparatus for producing packages consisting exclusively of

stretched linear polymeric filament bundles, in which apparatus the thread tension for starting the twisting operation is produced by introducing the thread bundle into a stream of a fluid which emerges from a nozzle at great velocity.

With the apparatus according to the invention the thread tension is further increased by introducing the filament bundle into the nozzle through a suction socket in which a vacuum is maintained.

A conduit receiving the bundle from the nozzle has a predetermined length and such a flow area that the velocity of the aforementioned fluid is not substantially reduced, the filament bundle being additionally tensioned in the conduit.

A further characteristic feature of the apparatus according to the invention consists in controlling the fluid jet which produces the desired thread tension simultaneously with the brake of the spindle which supports the tube onto which the filament bundle is wound. A valve controlling the supply of pressure fluid to the jet producing nozzle is so controlled that the valve is open when the brake is in the braking position and the nozzle is gradually closed after the brake is released.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself however and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing, in which

Fig. 1 is a diagrammatic illustration of a system according to the invention;

Fig. 2 is a side view of a cone including a catch for the filament bundle;

Fig. 2*a* is a top view of the cone shown in Fig. 2;

Fig. 3 is a perspective illustration of a device according to the invention;

Fig. 4 is a top view of a spindle brake in the position at the start of the spinning operation;

Fig. 5 shows the brake according to Fig. 4 in an intermediate position;

Fig. 6 is a top view of the spindle brake shown in Figs. 4 and 5 in the position during normal spinning;

Fig. 7 is a vertical sectional view of a brake controlled valve forming part of a nozzle aggregate according to the invention, the section being taken along line VII—VII in Fig. 9;

Fig. 8 is a vertical section of the nozzle aggregate according to the invention, the section being made along line VIII—VIII in Fig. 9;

Fig. 9 is an end view of the nozzle aggregate according to the invention.

The same numerals designate the same parts in all figures.

Fig. 1 diagrammatically illustrates a stretching and twisting apparatus including a pair of feed rollers **1**, **2**, a slowly rotating drawing roller **5** associated with a guide roller **4**, a relatively fast rotating drawing roller **7**, and a thread guide roller **6**. The filament bundle **3** which is supplied from a spool, not shown, passes between the feed rolls **1** and **2** and is stretched between the drawing rollers **5** and **7**. The subsequent twisting elements, namely, an eyelet **8**, and a traveller **9** carried by a ring **10**, guided by a ring carrier **11** function in the same manner as the corresponding elements in a conventional ring spinning frame. A tube **13** adapted to be mounted on a spindle **12** rotates with the latter, the tube **13** resting on a shoulder **14** of a cone **15**, to which a whorl **16** is secured. The spindle can be stopped by means of a spring operated brake **17**. This will be described below in greater detail. The outer marginal portion of a spindle rail **18** supports

a nozzle aggregate 19 into which a fluid, for example, compressed air of about 6 times atmospheric pressure is fed by a conduit 20. The expanded fluid flows through a discharge conduit 21 having a length of about 20 cm. into a conduit 22 placed alongside of the machine, a waste collecting container, not shown, being placed at the end of the conduit 22.

The filament bundle 3 runs in the conventional manner through the eyelet 8 and through the traveller 9 to the tube 13 on which the package is formed.

As has been explained in the preamble of this specification difficulties have been experienced when starting the conventional apparatus, which difficulties are overcome by the system according to the invention.

Fig. 3 is a perspective detailed illustration of a nozzle aggregate 19. The spindle brake 17 is mounted immediately below the whorl 16 between a cover sheet 28 and the spindle rail 18, brake shoes 29 and 30 individually mounted on levers 31 and 32, respectively (Figs. 4 to 6), being pressed against the spindle by means of a spring 33. For releasing the brake a spreading lever 34 revolving a spreading block 35 is provided, the latter having three pairs of parallel surfaces 37, 38, and 39. The distance between the surfaces of the pairs of surfaces 37 and 38 is such that it causes so much spreading of the levers 31 and 32 as to release the brake shoes 29 and 30. The distance between the surfaces 39 is smaller and does not cause spreading of the levers 31 and 32 and a disengagement of the brake. Spindle brakes of this type are conventional. The cone 15 is provided with at least one catch and preferably with two catches 23 and 24 for producing a right hand twist or a left hand twist. These catches are produced in a simple manner by bending inwards points 25 and 26, which are formed, if the upper part of the cone 15 is provided with a bore 27 as shown in Fig. 2. The catches do not protrude and cannot do any harm, when the spindle rotates at high speed.

A cam 36 is rigidly connected with the spreading lever 34, the cam having a substantially straight cam portion extending through an angle of rotation of the cam of about 60°. The nozzle aggregate 19 is fastened by screws to the spindle rail 18 and includes a suction socket 40, an exhaust pipe 21, an inlet element 43 (Fig. 7) for the pressure fluid, and a control rod 41 having a cam follower roller 42, supported at its free end. In the modification shown in Fig. 3 the roller at the end of the rod 41 is omitted so that the end of the rod abuts against the cam 36. A ball valve 45 is adapted to disconnect the inlet element 43 from a chamber 44 communicating with the inlet conduit 20. If the ball 45 is pushed to the left, pressure fluid can enter a bore 46 in the element 43 and can pass through radial bores 47 in the element 43 into the bore 48 of the body of the nozzle aggregate 19 which bore is closed to the outside by a portion 49 of the element 43. A nozzle member 50 (Fig. 8) is inserted in a widened portion 51 of a bore 52 of the suction socket 40 leaving a clearance 53 which communicates with the valve bore 48. Fig. 9 shows the intersection of the bores 48 and 51. The insert 50 is provided with a plurality of nozzle bores 54 which are inclined towards the longitudinal axis of the member 50 and in which the pressure of the fluid coming from the inlet element 43 is converted into motion causing a suction effect in the socket 40. As seen in Fig. 7 a spring 55 presses the valve ball against the member 43, closing the valve when the cam 36 is in the position shown in Fig. 6 which is the normal operating position.

Starting the twisting operation is effected as follows: The brake 29 to 33 is applied so that the spindle 12 is stopped by moving the lever 34 into the position shown in Fig. 4. The unstretched filament bundle 3 is placed past the feed and drawing rollers 1, 2, 4, 5, 6, 7 and through the eyelet 8 and the traveller 9 into one of the catches 23 or 24 which are located above the whorl 16 on the arrested spindle 12. Therefrom the filament bundle is passed through a slot 57 of thread guide ring 56 into the section socket 40 of the nozzle aggregate 19. The stationary or slowly moving filament bundle is stretched by the suction in the socket 40 and the great velocity of the fluid in the exhaust pipe 21 which is connected to the lower end of the member 50, the stretching force being approximately 50 grammes as required for heavy titres. Thereupon the filament bundle is placed in the nip formed by the feed rollers 1 and 2. The great velocity of the pressure fluid produced in the nozzle aggregate ensures withdrawal of the supplied filament material so that there is no accumulation of material or an undesired sag between the traveller 9 and the eyelet 8. The filament bundle can now be laid around the first drawing rollers 5 and thereupon around the second, faster rotating drawing roller 7 and the drawing operation can be initiated so that stretched material is supplied to the twisting unit at an increased speed which corresponds to the drawing ratio. By setting the brake 17 in the intermediate position shown in Fig. 5 in which the brake is released and the nozzle aggregate is effective because the valve 45, 43 is open, and by severing the filament bundle between the suction socket 40 and the catch 23 the twisting operation is started. The filament bundle taken along by the catch 23 is wound several times on the tube 13 at the elevation of the traveller at this moment whereupon the normal twisting and spooling operation begins. The severed end of the filament bundle is removed through the nozzle aggregate 19, the other end of the bundle which is hooked in the catch 23 is thrown outwardly by centrifugal force as long as the spindle rotates. This other end of the bundle is therefore free until the package is completed and is available for connecting to the upper end of the subsequently produced package. When normal twisting and winding has begun the spreading lever 34 is moved into the position shown in Fig. 6 so that the nozzle aggregate is made ineffective while the brake is disengaged.

By moving the brake actuating lever into the intermediate position shown in Fig. 5 closing of the valve 45, 43 is automatically delayed so that the nozzle aggregate remains effective. If the valve is closed prior to severing the filament bundle, the severed end of the filament bundle is not removed. This undesired effect of such faulty operation of the device can be eliminated by permanently producing a reduced pressure in the conduit 22.

The apparatus according to the invention has the great advantage of delaying rotation of the traveller until stretched material is available and a traveller can be used which is coordinated to the drafting ratio. In all conventional arrangements a traveller must be used whose weight corresponds to the heavy unstretched material, which is supplied only during a short period of time, for starting the twisting operation so that a much too heavy traveller is used for the subsequent twisting operation. The apparatus according to the invention avoids this shortcoming of the conventional arrangements.

A further advantage of the apparatus according to the invention resides in the use of a pressure fluid and the provision of a waste collector which is not connected with a vacuum producer. This makes all precautions for preventing entry of waste into the vacuum producer unnecessary. Since compressed air is available in all industrial plants, use of the apparatus according to the invention is always possible, in contradistinction to apparatus which rely on the use of vacuum which is not as frequently available as is compressed air.

What is claimed is:

1. An apparatus for producing packages from a stretched linear polymeric filament bundle, comprising a rotatable spindle, a tube mounted on said spindle onto which tube the stretched bundle is wound by a twisting operation, a nozzle from which emerges a high speed jet of a pressure fluid, means for introducing the filament bundle into the jet prior to the beginning of the

twisting operation for producing a tensioning of the bundle by the action of the jet as required for the beginning of the twisting operation, a brake for said spindle, control means for controlling the supply of pressure fluid to said nozzle, and means for actuating said brake, said last mentioned means being operatively connected with said control means for actuating the latter simultaneously with said brake actuating means.

2. An apparatus according to claim 1 in which said brake actuating means includes means for applying said brake and simultaneously opening said control means for supplying pressure fluid to said nozzle, means for disengaging said brake and holding said control means open, and means for disengaging said brake and closing said

control means for interrupting the flow of pressure fluid to said nozzle.

3. An apparatus according to claim 1 in which said control means includes a valve, a rod associated with said valve for actuating said valve, and in which said brake actuating means includes a cam engaging said rod.

References Cited in the file of this patent

UNITED STATES PATENTS

1,962,265	Wenzel	June 12, 1934
2,412,403	Jackson et al.	Dec. 10, 1946
2,572,138	Griset	Oct. 23, 1951