Oct. 22, 1929. P. D. CANNON 1,732,592

MACHINE FOR SPINNING COMPOSITE YARNS

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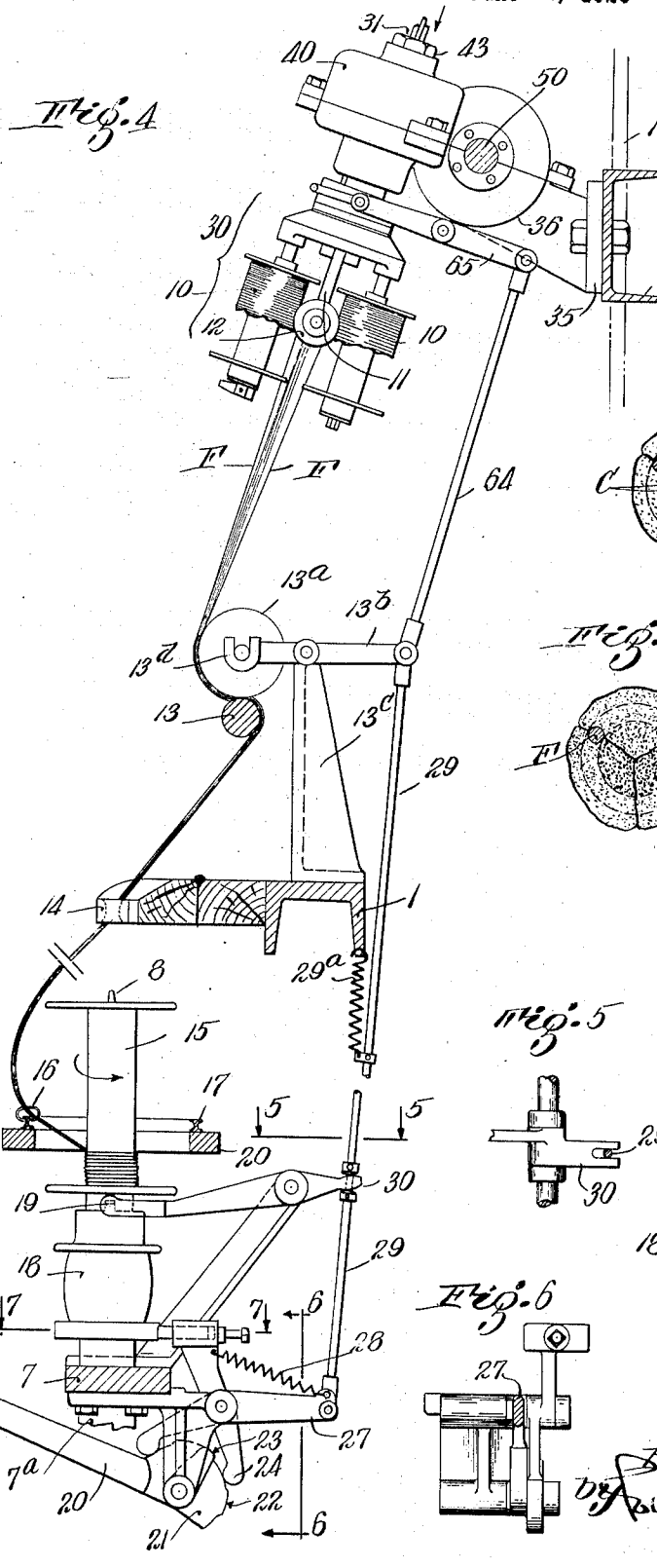


Fig. 1

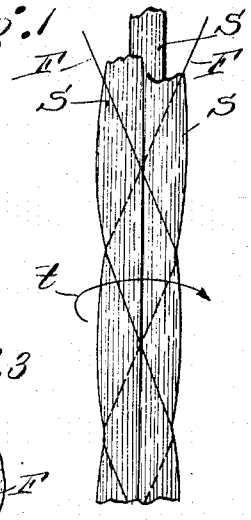


Fig. 3

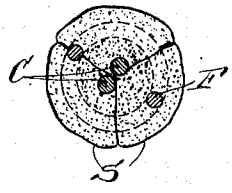


Fig. 2

Fig. 5

Fig. 6

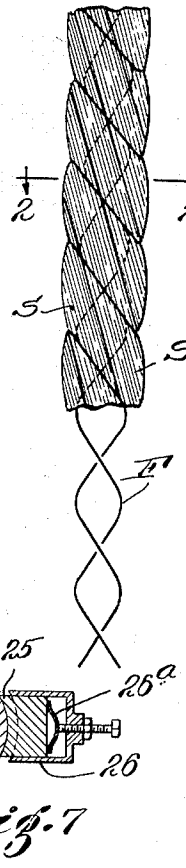


Fig. 7

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MACHINE FOR SPINNING COMPOSITE YARNS

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Fig. 9

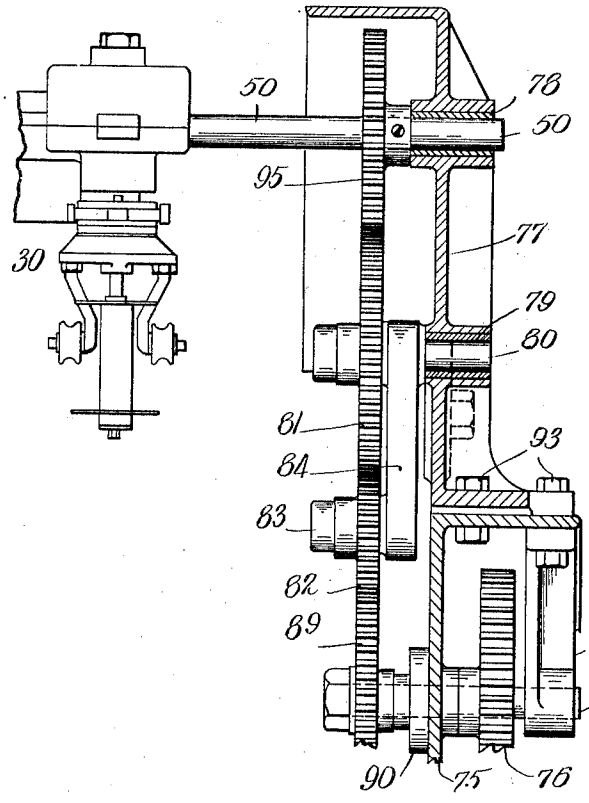


Fig. 8

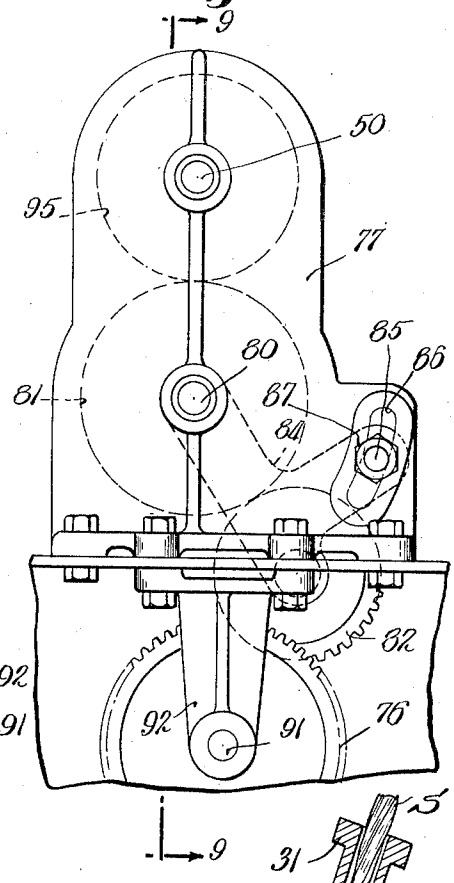
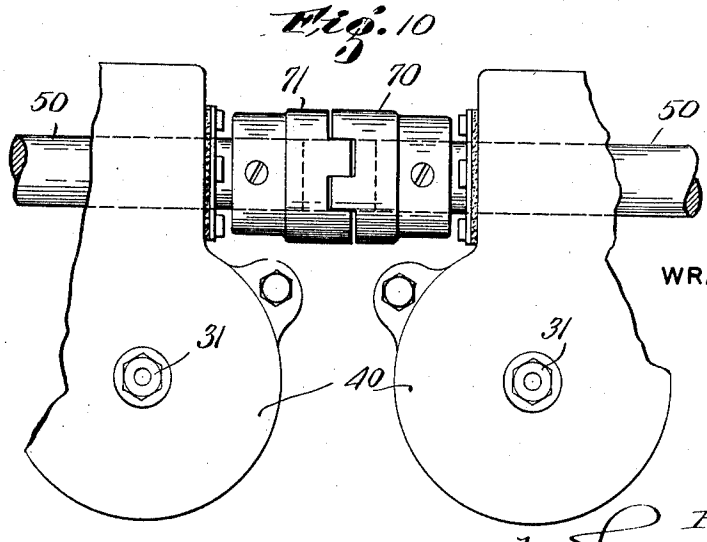


Fig. 10



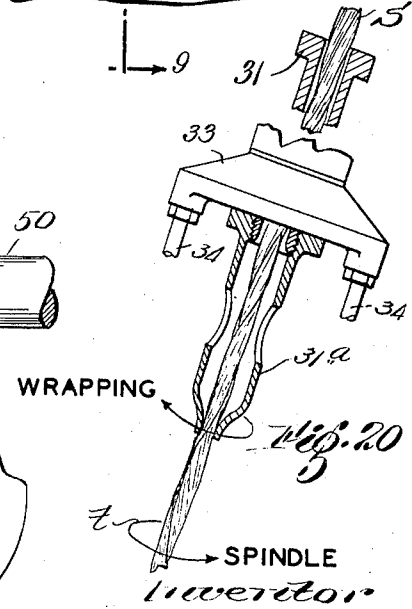


Fig. 20

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MACHINE FOR SPINNING COMPOSITE YARNS

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Fig. 11

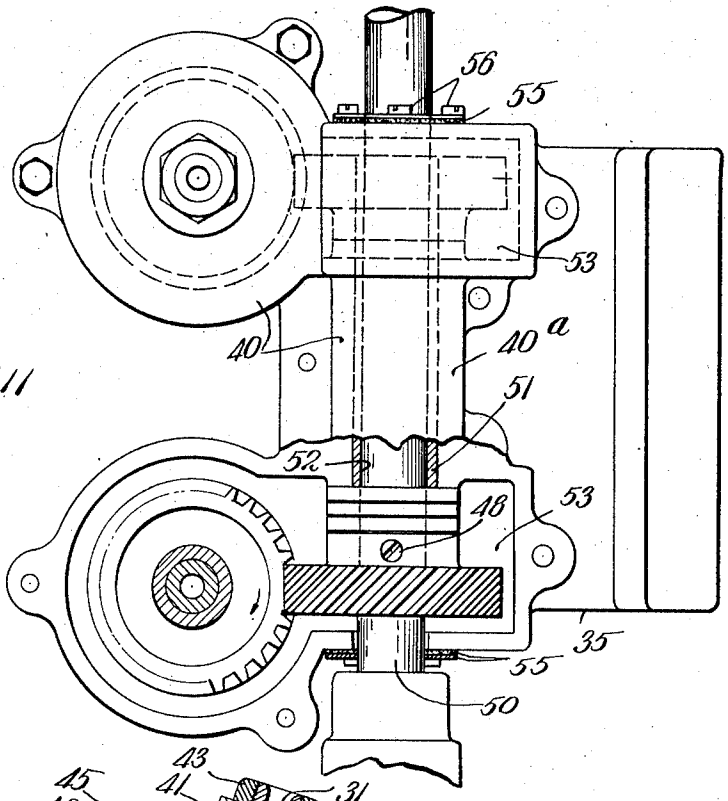
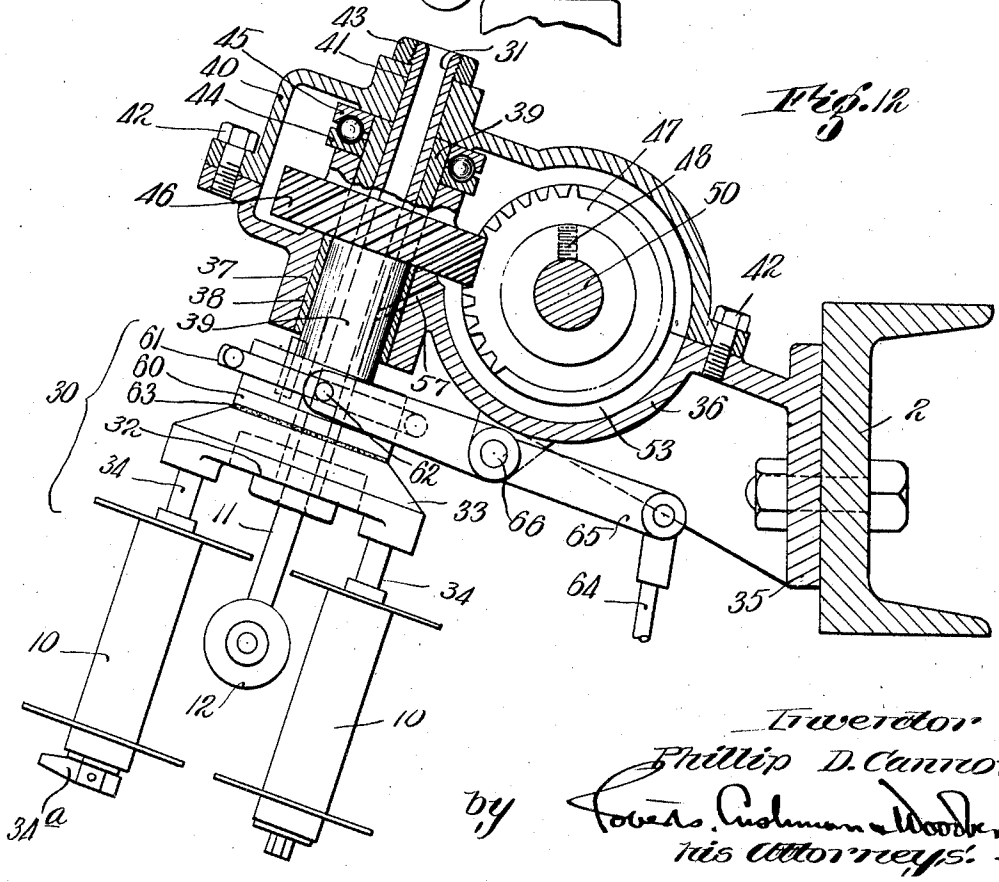


Fig. 12



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MACHINE FOR SPINNING COMPOSITE YARNS

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Fig. 14

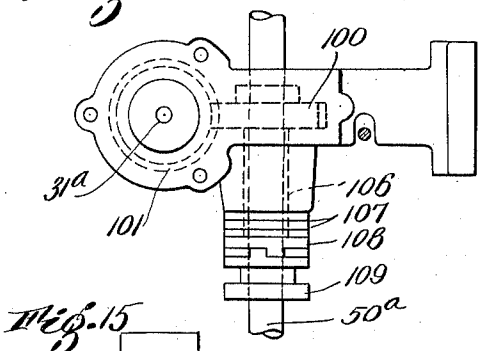


Fig. 15

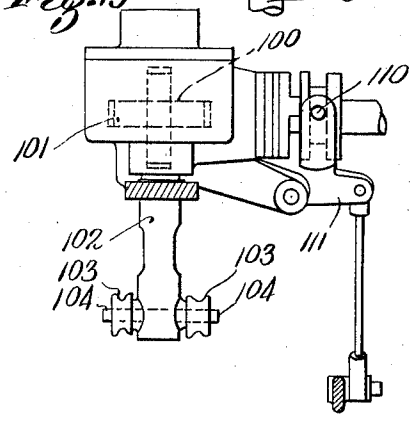


Fig. 13

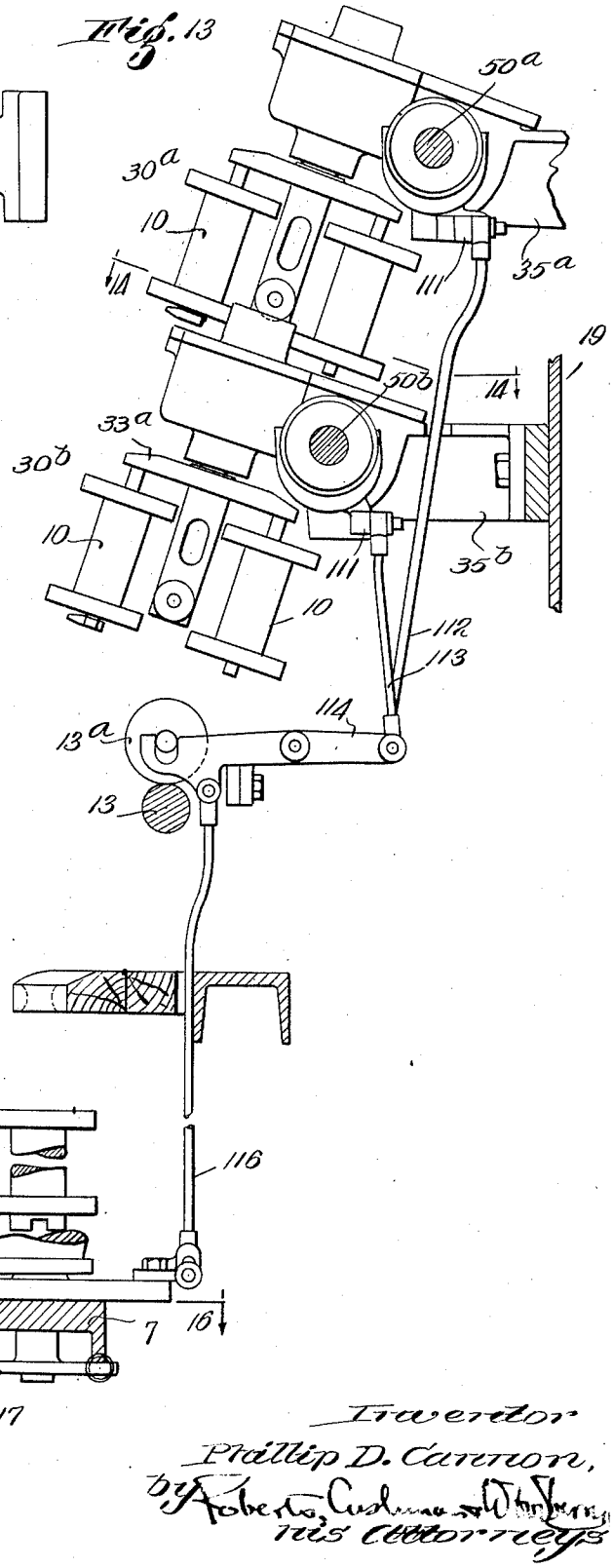
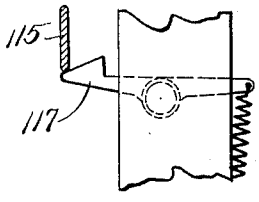


Fig. 16



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MACHINE FOR SPINNING COMPOSITE YARNS

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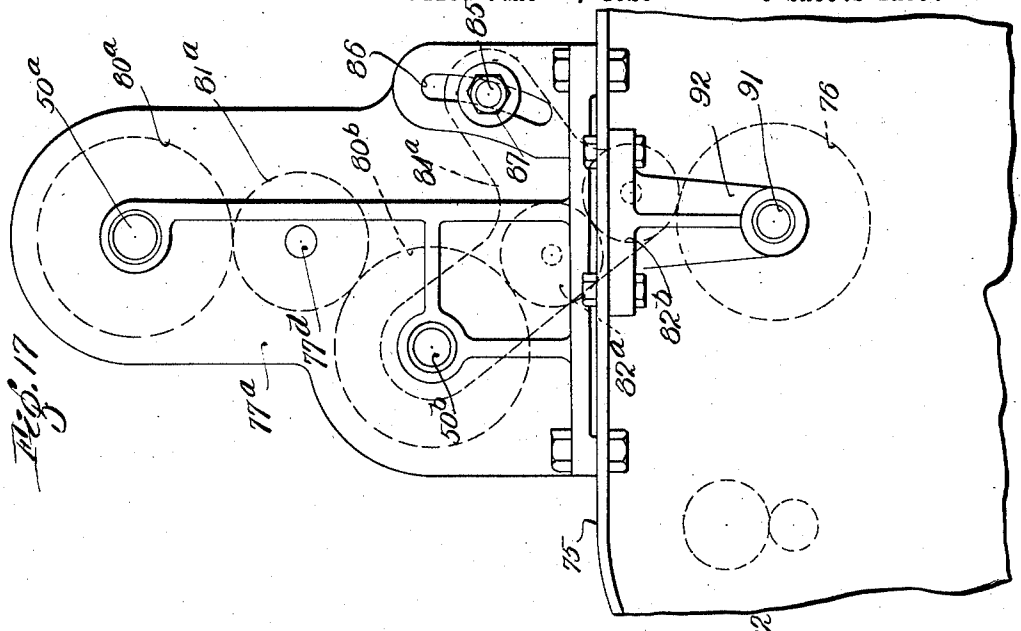


Fig. 17

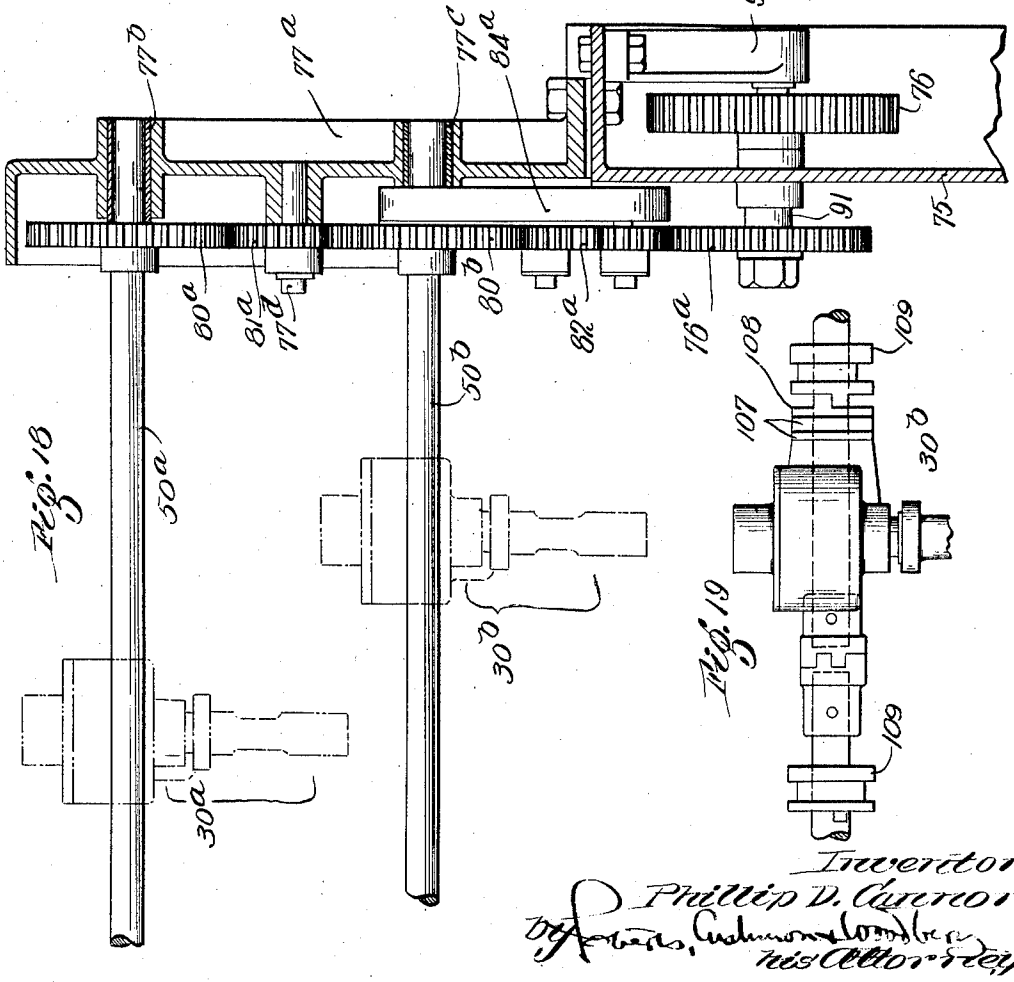


Fig. 18

Fig. 19

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Patented Oct. 22, 1929 1,732,592

UNITED STATES PATENT OFFICE

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MACHINE FOR SPINNING COMPOSITE YARNS

Application filed June 22, 1928. Serial No. 287,463.

This invention relates to the production of yarns or strands of composite structure comprising textile fibers.

A principal object of the invention is to provide for the regular, uniform and efficient production by machinery of yarns from pre-formed rovings, slubbings, or elongate masses of fibers, hereinafter mentioned as rovings, which, by reason of their short length, their relative stiffness, or their inferior coefficient of surface friction, or for other reasons, are ill adapted to the formation of a strand, yarn or the like by the usual processes of spinning. A further object of the invention is to provide for making a spurn yarn of superior tensile strength by a spinning operation carried out on a roving of a composite nature, not necessarily prepared by previous twisting, and containing or partly consisting of asbestos fiber as the chief staple, but not excluding other fibers such as cotton or other vegetable, animal, or artificial textiles. A further object of the invention is to provide spinning and other machine agencies adapted to deal with relatively weak, short length fibers supplied in the form of a pre-formed roving in such a way as to reinforce the roving by a wire, textile cordage or other element applied to the roving, so as to cooperate in the spinning, longitudinally tensioning, and winding operations carried out by the machine, to produce a yarn of the said short fibers, with or without an aiding inclusion of other textile fibers, which shall be of relatively high tensile strength comparably with the expected aggregate strength of the twisted mass of roving and its reinforcing inclusions.

A still further object of the invention is to provide devices for applying in wrapping or core-covering non-central relation to a roving, single or multiple, a strand or strands of any filament, including thereby any strip, strand, yarn, cordage, wire or other appropriate material. A still further object of the invention is to provide for spinning a wrapped or covered slubbing, roving or elongate mass of fiber into a denser, harder kind of strand or cordage than the roving, without necessarily subjecting the aggregate filaments spun to drawing; to provide for winding onto a receiving spool or bobbin a completed strand in accordance with its production, and to provide adequate machine devices aiding doffing and donning the wound packages or their cores or bobbins; to provide for driving and stopping the roving or slubbing wrapping or covering elements and take-off means of mechanism for the general purposes mentioned in relation to the driving and stopping devices for a spinning spindle relied upon for the spinning twist and for bobbin or spool-winding energy; and to provide mechanism for performing these operations which shall be durable, efficient and convenient and permit the orderly building of a wound bobbin, spool or package of the completed product. Although the operation of spinning is usually understood to involve drawing as well as twisting, and although the twisting of the wrapped roving strand herein described may involve very slight drawing, or perhaps none at all, nevertheless, since the twisting of the said wrapped or fasciated strand is shown as, and will usually be done by, a ring-spinning apparatus, and would naturally be called spinning, I apply that term herein to the operation shown as performed by a ring spinning apparatus, whether drawing by an accompaniment of twisting or not.

The invention will now be explained with the aid of drawings of certain species only of preferred forms of machine devices according to the invention, the forms of the apparatus shown in the drawings being illustrative only. In the accompanying drawings:

Fig. 1 is an elevation, parts being broken away, of a characteristic product of the operation of the machine;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a similar section showing a modified form of the product;

Fig. 4 is a vertical transverse section through the devices of one side only of a spinning frame embodying the invention;

Fig. 5 is a detail plan on the line 5—5 of Fig. 4;

Fig. 6 is a detail elevation, partly in section, on the line 6—6 of Fig. 4;

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Fig. 7 is a detail section on the line 7—7 of Fig. 4;

Fig. 8 is a detail right hand elevation of a spinning frame according to Fig. 4;

Fig. 9 is a front elevation corresponding to Fig. 8 partly in section on the line 9—9 of Fig. 8, and showing one of the wrapping heads and its driving connections;

Fig. 10 is a detail plan above two adjacent driving heads;

Fig. 11 is a detail plan, partly broken away to show some of the interior parts of the driving heads;

Fig. 12 is a vertical section partly in elevation corresponding to parts shown in Fig. 4 and in Fig. 11;

Fig. 13 is a vertical transverse section of a spinning frame corresponding to Fig. 4, and showing certain modified forms of the devices;

Fig. 14 is a detail plan above one of the wrapping heads shown in Fig. 13, partly in section on the line 14—14 of Fig. 13;

Fig. 15 is a detail left hand side elevation of parts shown in Fig. 13;

Fig. 16 is a detail in plan of parts shown in Fig. 13;

Figs. 17 and 18 are respectively an end elevation and a front elevation at one end of the frame showing a modified form of driving means particularly useful with the devices of Fig. 13;

Fig. 19 is a detail plan of parts used with the form of Figs. 13 and 14; and

Fig. 20 is a vertical section through a wrapping head showing a modification.

The machine about to be described is particularly adapted to practice the process and produce the product shown, described and claimed in my application for Letters Patent of the United States Serial No. 287,464 filed June, 1928, concurrently herewith, and I do not herein claim the process or the product described and claimed in the said application.

Referring however to Figs. 1 to 3 inclusive, for explanation the preferred product of this machine may comprise the composite yarn best shown in Fig. 1 and comprising a number, shown as three, of rovings or slubbings, generally made by dividing the fleece of a carded composite of short fibers of a kind, such as asbestos, relatively difficult to spin and a small proportion of longer, easier spinning fibers, and condensing the divided fleece into an untwisted roving. Such rovings, which may be of any desired number in each completed strand or yarn, are shown at S in Figs. 1 to 3 and 20. According to a preferred operation, the rovings S, extending as straight as may be toward a pair of take-off rolls, are first wrapped with a spiral wrapping of a filament, usually a thin brass wire, shown at F. There may be a plurality of these wrapping filaments, shown as two; and a preferred way to lay them on the rovings S is to place them in relatively quick-pitched, mutually interleaved spiral relation to a straight extent of rovings moving lengthwise into devices for giving the composite strands a spinning twist. The wrapped rovings are now subjected to a twist to spin the aggregate comprised of the rovings S and the wrapping F into a completed strand or yarn, and upon subjecting the lower part of the wrapped roving to a spinning twist in the direction of the arrow *t* on Fig. 1 or Fig. 20, there will result a twisted or spun yarn in which the final directions of the lengthwise-lying fibrous components of the rovings S, S, as twisted together, will lie at a lesser angle to the axis of the completed yarn than lie the wrappings F, F. Because of the original spiral relation of these wrappings, they tend on lengthwise stress to tighten upon their axis, occupying the position shown in the lower part of Fig. 1 in relation to the position there shown for the roving strands S and the fibers in these strands. If desired, the roving strands S may be accompanied into the relation shown in Fig. 1 by a central core strand or strands, for example as shown at C, Fig. 5.

As more fully explained in my said application, one result of first fasciating and then giving a spinning twist to a bundle of rovings of the character indicated is to compress the substance of the rovings under the twisting pressure of the wrapping filaments F, and thereby to hold the component short fibers in superior frictional contact with each other while being spun and afterward; another result of the described relation of the wrapping filaments to the fasciated roving or rovings is firmly to hold at least the greater part of their component fibers in a longitudinal bundle in a compressed state between the filaments F, which further results in burying the filaments F between extruded parts of these strands.

In order to perform the operations indicated it will be observed that it is desirable to provide for feeding a strand or strands S toward some device for spinning, and further desirable to lay upon them the fasciating wrapping of the filaments F, F before the general aggregate of strands is subjected to twisting. Otherwise, the tendency of the harder and less extensible element of the aggregate of strands would be, as well known in the prior art, to cause the harder, less extensible elements to twist together at the center of the material containing the more easily elongated rovings as a mere covering for a core composed of the twisted strands of the harder element. In the usual mode of spinning asbestos yarns, for instance, it has been found that an aggregate of two or three or more rovings and two or more wires led to the usual ring-spinning twister head simply results in a yarn having two

wires twisted together for a core, and a spun covering of the asbestos or asbestos and cotton rovings. This in turn has led to the assumption that it was practically necessary to build up such yarns out of pre-spun yarns, rather than of stubbings or rovings, so that the covering armour of asbestos or asbestos and cotton could have sufficient firmness to retain the core, and not to be skinned away from the core on such stresses as come on the yarn in weaving. As pointed out in my said application, one of the principal advantages of the invention claimed in it as applied, for example, to asbestos yarns, is the new association of rovings and wrappings in such a way as completely to avoid the defect of skinning; and another principal advantage is the production of a yarn of greatly increased tensile strength (as compared with standard asbestos yarns, for example, made of scarce and expensive long-fibered asbestos and the same kind of wire inclusion) from rovings of asbestos of kinds heretofore believed not to be fit for spinning because their fibers were not only of intractable stiffness, smoothness and incapacity to twist togther in permanent union, but were too short to be efficiently held by any permissible proportion of added cotton or other textile fiber having good carding and spinning properties.

Assuming that there shall have been provided mechanism serving to manufacture in any usual way a carded fleece, which may and usually does contain as much as 5% or 10% by weight of average or short staple cotton and, in a typical instance, about 90% of the mentioned short-fiber asbestos, means are provided to divide this fleece and to condense or gather it together by trumpets, rubbing belts, etc., and, if desired, to wind the condenser rovings into balls or cheeses, all quite as usual. The present invention provides mechanism for manufacturing such roving and other like material into an improved kind of strand or yarn without the expensive intervening operation of spinning the rovings into yarns. This intervening step moreover required a roving capable of being spun; in the case of asbestos, this necessitated the use of scarce and expensive material.

Referring now to Fig. 4, the present devices are concerned with mechanism for taking the roving from the condenser card, without any previous twisting or drawing or spinning, and so operating upon it as to form the fasciated composite yarn mentioned above. A preferred instrument for so operating upon the roving as shown in said figure may be a spinning frame of any desired type, shown as a ring frame, one longitudinal half of the machine appearing in cross section in Fig. 4, and comprising as usual a machine frame having an upper extension 1^a, appropriate longitudinal struts of which two are shown at 1, and at 7, the strut 7 serving as a spindle rail; and of course having any desirable transverse supporting frames for longitudinal shafts, including a shaft for the spindle band roller, not shown, and a driven shaft 13 usually employed as the bottom member of a set of drawing rolls, but here put to different uses.

For the present purposes the upward extension of the frame at 1^a may be reinforced by a longitudinal channel beam 2, added to the spinning frame for the purpose of carrying supporting and operating means for certain twister heads presently mentioned.

The spindle rail 7 may be of any usual or desirable construction, supporting bolster rests 7^a in which rotate vertical spindles 8, preferably driven by a whorl of the flat-band type shown at 18, having an upper clutch face at 19 formed to engage a clutch face formed on the bottom end of the quill, bobbin or spool, shown as a spool 15.

Supported on one of the longitudinal struts 1 by the usual finger board, any suitable form of pot eye like that shown at 14 may be relied upon to guide the top end of the balloon of a twisting roving to be spun and wound upon the spool 15, for example by the drag of a relatively heavy traveller 16 running on a ring 17 carried by a ring rail 20.

The ring rail 20 may have the usual vertical motions for putting a winding upon the spool 15, or any other suitable carrier mounted on the spindle 8. The builder motions, the driving devices for the spindle 8, and the means for rotating the roll 13 may be all as usual in the prior art, and for that reason are not shown except as they are modified for purposes presently explained in connection with Figs. 8 and 9, Figs. 17 and 18. The supplies of roving S may as usual be wound on cores as cheeses or provided as conical cops, or drawn from rotating bobbins, and in either case the upward projection 1^a of the spinning frame will provide a suitable rack mounting for skewers for the unwinding packages, or a mounting for cradles or other unwinding gear for unwinding bobbins or spools. These devices, of which any efficient form may be used, deliver the roving S downwardly in the transverse plane of each of the spindles 8, operating in which plane there are provided machine devices for wrapping the binders F about the rovings, preferably on their way to the driven roll 13, which is utilized as a take-off and pay-off roll determining the relation of lengthwise progress of the roving through the pot eye 14 and traveller 16 to be wound on the spindle, bobbin or spool 15. The warpping devices may therefore be mounted in a position to surround the runs of the roving from the roving carrier packages to the spinning devices, one in the plane of each

spindle 8; each of a series of wrapper devices is generally designated at 30.

For the purpose of this invention it is desirable that the wrapping head 30 shall operate to lay at once one, and preferably two or more, binding filaments on the running roving, which, in order to be drawn off by the operated roll 13, is preferably held down by the weighted top roll 13^a, Fig. 4, normally resting on the wrapped rovings passing over roll 13. Desirable operating conditions will be satisfied if binding filaments F, F are caused to rotate about an axis defined by the running rovings, so that the crossing point of either binder and the roving is at or near the tangent to the periphery of the roll 13^a. It is therefore convenient and desirable to operate the wrapping head for laying the filaments F, F about an axis in the plane of the spindle 8 and inclined vertically.

Since the preferred filament of binding material is capable of being wound on spools, in the construction shown in Fig. 4, and in detail in Figs. 11 and 12, a hollow tubular axis 31 providing a shoulder 32 on which runs a winding head 33 is provided to be supported in the said plane and at said angle, as best shown in Fig. 12. For example, there may be mounted on longitudinal strut 2 supported on the upper extension 1^a of the spinning frame an angle bracket 35 preferably of cast metal providing the lower half of a casing 36 extending upwardly and outwardly from the strut 2 and suitably bored at 37 and bushed at 38 to receive a tubular drive shaft 39 surrounding and having a bearing on tube 31, which tube 31 passes through a bore 41 in a hollow casing cover 40 fastened on the plane upper surface of the angle bracket suitably, for example by screws at 42, 42. The tube 31 may be held by a nut 43. Preferably the sleeve 39 is fast to the lower member 44 of a ball thrust bearing having an upper member 45 taking against the inner face of the cover 40 to receive the thrust of a driven member 46 fast on the sleeve 39 of a pair of spiral gears 46, 47. The member 47 of this gearing is fastened, preferably by a deeply spotted set screw 48, on a shaft 50 extending through openings in the casing 36 and cover 40.

In a preferred form the angle bracket 35, see Figure 11, is wide enough to accommodate two winding heads, and in that case it is preferred that the shaft 50 shall have a bearing occasionally, for example, in a bushing 51 in a bore 52, in that part of the bracket 35, standing between the hollows at 53, 53, in which the gears 47 run. The casing cover 40 for two adjacent gear trains may be integral, or the section 40^a containing a mating half of the bore 52 for the bushing 51 may be separately made, if desired.

The hollows 53, 53 desirably contain oil or a lubricating emulsion, and to avoid leakage the shaft 50 may run in sealing disks 55, 55, Fig. 11, suitably held by screws 56 against the face of the casing 36. Referring to Fig. 10, the shaft 50 is preferably made in short separable lengths serving a small number of winder heads 30, the sections of the shafts 50 terminating in clutch faces 70, 71, Fig. 10, the meeting clutch faces being of such construction as to permit the sections of the shaft 50 to operate on axes at slight angles to each other. This is of aid in assembling the drive shaft 50 and heads 30 on existing spinning frames, permitting the shaft 50 to operate when not in strict alignment.

The bushing 37 for the drive shaft 39 and the drive shaft 39 may be penetrated by oil holes communicating with an oil passage 57 in the casing 36.

Splined on the bottom end of the shaft 39 a grooved clutch collar 60 carrying an operating ring 61 can be provided to be moved by an operating fork 62, so that when lifted a friction pad of leather, or the like, shown at 63, will be lifted clear of the upper face of the driving head 33. The fork 62 may be integral with a lever 65 pivoted at 66 on a lug of the casing 36, and adapted to be operated by link 64 as presently to be described.

The head 35 carries on suitably, and preferably symmetrically placid, studs 34 unwinding spools 10 adapted to deliver their windings over grooved anti-friction rolls 12, which may be mounted on studs 11 fast in the head 33 at symmetrical distances from the axis of rotation of the head 33. The spools 10 may be held on the studs 34 by pivoted cross latches 34^a. Usually the tension on the faces of the spools 10 is sufficient to prevent overrunning of the spools 10 in unwinding, but any suitable tension devices may be applied to these spools, or the surfaces of the unwinding filament on them, within the invention.

Referring now to Fig. 20, it is sometimes desirable to wrap and spin very weak roving S, originally of such thickness as to crowd the tubular passage in hollow shaft 31; or to operate upon rovings or condenser slivers so weak as not certainly to transmit an unwinding stress to a wound package of these rovings or slivers. In that case it is desirable to increase the tensile strength of the bundle of material to be wrapped to a point beyond the wrapping head. One way of doing this is to put into the bundle of rovings or slivers a false twist at exit from the wrapping head. As shown, the tube 31 may for this purpose be provided with an enlarged tubular extension 31^a swaged, preferably to an oval cross-section, at its lower end. The false twist decreases the thickness of the bundle of rovings S in tube 31 and imparts an increased tensile strength to the bundle of rovings or slubbings to be wrapped as far as the rolls 13, 13^a and the supply packages above the wrapping heads. Any slightly-compressing or fric-

Machine for Spinning Composite Yarns (US Patent 1,732,592, 1929)
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tion device below the end of tube 31 and rotating with the wrapping head may be resorted to instead of the swaged tube 31^a with the same effect. As shown in Fig. 20, the tube 31 may rotate with the head 33 and tubular shaft 39, Fig. 12, if desired.

Referring now to Figs. 8 and 9, in the existing spinning machine shown by way of illustration, the transmission gearing for coordinating relative speeds of the driving drum for the spindle bands (not shown) and the bottom drawing roll 13, and the builder motions of the ring rail 20 is housed in a casing 75, the right hand end of the spinning frame in its elevation corresponding to Fig. 9. The casing 75 is securely fastened to one of the transverse elements of the machine frame, and accessible at one end. This is typical of usual spinning frame construction. It is therefore preferred to provide for driving the shaft 50 for working the wrapper heads 30 from one of the existing gears in the casing 75, for example gear 76 forming a part of the train for roll 13, the remainder of which is not shown. For example, there may be erected on the top of the casing 75 an integral cast bracket 77 bored and bushed at 78 for the shaft 50 and bored at 79 for a stud shaft 80 carrying a gear 81 meshing with a transmission gear 82 bearing on the stud 83 of a radius arm 84 bearing on stud 80 and having a threaded stud 85, Fig. 8, working in the sector slot 86 of the bracket 77, in which it is adapted to be held by nut 87 so that the pinion 82 carried by the arm 84 may be adjusted to accommodate one of a set of change gears of which the member shown in use at 89 is provided to be driven in unison with the said existing gear 76.

In order to drive the gear 89 the casing 75 may be provided with a bushing 90, bored to receive a drive shaft 91, to replace the existing stud for the gear 76, upon which shaft 91, gear 76 and gear 89 are both fastened. Preferably the outer end of the shaft 91 is supported by a bearing held in the bracket 92, which may be held against the top web of the casing 75 by the holddown bolts 93 relied upon to fasten down the bracket 77.

The right hand end of the shaft 50 has fastened to it a transmitting gear 95 which meshes with the gear 81 above described.

It will be observed that by the additions mentioned to the existing machine, the shaft 50 may be driven at a selected speed in relation to the motions of the roll 13 and in relation to the revolutions of the spindle 8. For example, the wrapper head 30 may be driven at the ratio of about one to every fifteen turns of the spindle 8.

The capacity of the supplies of roving and the capacity of the spools 15 not being unlimited, it is necessary occasionally to stop to doff a full spool 15, to replace and piece in rovings, to replenish the wrapper head with fresh spools 10. In ring frames of the kind uitilized, it is customary to stop the spindle by a knee lever operated brake. But in the type of spindle drive shown this is not the best practice, resulting in undue breakage of spindle bands. It is moreover inconvenient if the operator shall have more than one of the usual piecing-up or replenishing or doffing operations to perform to rely upon a knee lever which starts the motion again on mere release.

Referring now to Fig. 4, it is provided to temporarily throw out of operation the wrapper head 30 whenever the spindle 8 is stopped, and coordinately to lift the top roll 13^a. It is further provided that momentary stoppage of the spindle shall be for only a time sufficiently long to lift the spool 15 from clutch engagement with the whorl, the roll 13^a remaining lifted and the wrapper head 30 stopped during resumption of motion of the spindle; but the spindle is provided to be stopped again during donning of a spool 15 and before resumption of motion of the head 30. Mounted on a bracket on the spindle rail 7, Fig. 4, the pivoted throw out handle 20 carries a cam 21 provided with cam surfaces 22, 23 adapted to react with one arm of a lever 24 pivoted on said bracket, the other arm of which carries a fiber brake shoe 25, see Fig. 7, bearing on the surface of the whorl 18. Preferably the brake shoe 25 fits in a casing 26, in which it can move against a steel bow or other compression spring 26^a. The lever 24 is normally pulled away from the position shown by a spring 28. There is also pivoted on the bracket on the spindle rail 7 a two-armed lever 27 adapted to be acted upon by the cam face 23, and when so acted upon to pull down the tension rod 29 having stops to react on one end of a lever 30, the other end of which is made as a fork bearing under the lower flange of a spool 15. On compressing the lever 20 the whorl is braked during passage of the cam 22, and while the lever 27, acting through the link 29 and lever 30, lifts the spool 15 out of clutch engagement with the whorl 18 and is then permitted to operate the empty spindle on complete depression of handle 20.

The link 29 extends unwardly to pivotal engagement with one end of a lever 13^b pivoted on a bracket 13^c and terminating in forks 13^d supporting the heavy top roll 13^a. Motion of the handle 20 therefore lifts the top roll 13^a.

Connected to the link 29 a link 64 is also pivoted to the inner end of the lever 65, serving to lift the clutch collar 60 and stop the wrapping head whenever the link 29 is actuated. The weight of the connection 29 etc. may be counterbalanced by a spring 29^a, Fig. 4.

Referring now to Figs. 13 to 19, inclusive, it may be the case that an existing spinning frame is required to be improved by the provision of the devices above described, but that

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because of the narrow spacing of the spinning spindles, or because it is desirable to wind from a supply of wrapping or binding filament on larger size spools than those indicated in the description above, it is not practicable to wind a wrapping about the running supply of roving from wrapping heads placed in order on the same operating shaft, the necessary dimensions of the wrapping heads being greater than the width of the distance between spindles.

In that case resort may be had, see Fig. 18, to staggering the wrapping heads indicated at 30ª and at 30ᵇ, wrapping heads for alternate spindles being operated by an upper longitudinal shaft 50ª and for the intervening spindles being operated by a shaft 50ᵇ, these respective drive shafts being driven by gearing carried in an auxiliary bracket of the kind shown in Figs. 17 and 18, at 77ª, which bracket provides bushed bearing bores at 77ᵇ and 77ᶜ, respectively, for the shafts 50ª and 50ᵇ. Fast on the shaft 50ª is a gear 80ª and fast on the shaft 50ᵇ is a gear 80ᵇ, the gears 80ª and 80ᵇ being connected for operation in opposite directions by a gear 81ª on a stud 77ᵈ in the bracket 77ª.

To drive the gear 80ᵇ and the remainder of the train the shaft 50ᵇ may carry an arm 84ª on which the gear train 82ª, 82ᵇ may be relied upon to transmit power from a changeable gear 76ª on a shaft 91 driven by the gear 76 in a bearing in the casing 75, and having its outer end supported at 92, as above described.

Wrapper heads 30ª and 30ᵇ, Figs. 13 to 15, suitable for this staggered arrangement on the shafts 50ª and 50ᵇ may be mounted on angle brackets 35ª and 35ᵇ on upward extension 1ª of the machine, as in the case of the form described above. These brackets provide hollow housings for operation by a driving member 100 of a pair of spiral gears 100, 101, Figs. 14 and 15, the gear 101 being fast on a tube 102 rotating about a guide tube 31ª for the rovings. The tube 102 may support the head 33ª for spools 10, above described, and grooved guide wheels for the binder filament may be provided at 103 on transverse studs 104, 104, mounted in the tube 102.

When there are two series of wrapper heads, it is preferred to stop and start the individual wrapper heads by severally clutching the driving gears 100 to their operating shafts 50ª or 50ᵇ. As shown, the gear 100 may be mounted on a sleeve 106 extending through anti-friction disks 107 terminating in a clutch face 108 to be engaged by a clutch member 109 splined on the shaft 50ª or 50ᵇ. The clutch member 109 is grooved for pins 110 in yoke arms of a bell crank lever 111 operated by a link 112 or 113, as the case may be, see Fig. 13, from a lever 114 relied upon to lift or lower the top roll 13ª, Fig. 13. The lever 114 may be operated in this form of the device by the usual spindle braking knee lever 115 to which is pivoted a push rod 116 connected to the lever 114.

A latch 117 may be provided on the under side of the spindle rail 7 to lock the knee lever 115 in its inward position in which it acts as a brake on the bottom face of the whorl 19. The spool 15, spindle 8, ring and ring rail, not shown, may be as above described.

The operation of the device will now be evident. If desired, a multiple or single cordage or wire core may be led through the guide tube 31 or 31ª to accompany the roving toward the draw-off rolls 13, 13ª, and spinning spindle. Such a core, if multiple, will be twisted together by the spinning twist, much as in the familiar operation of forming an asbestos yarn from prespun rovings, and two or more wires, which, however fed, invariably will be found at the center of a covering armor of the asbestos rovings.

On rotation of the wrapping heads 30, 30ª or 30ᵇ the covering filament from the spools 10 will be laid about the roving or rovings S according to the effective speed of the draw-off rolls 13 and 13ª, and the effective speed of the heads 30, 30ª or 30ᵇ, in interleaved spirals. The point of contact of the filaments F, F with the rovings S is at or near the tangent to the surface of the top roll 13ª occupied by the rovings being wrapped. The twist from the operation of the spindles and the motion of the travellers extends up through the pot eye 14 to the nip between the rolls 13 and 13ª, and does not affect the rovings before they have been securely wrapped.

In the preferred operation of the device, the wrappings of binders F, F are laid clockwise when looking down at a horizontal cross section of the wrapping filaments, whereas the motion of the spindle and traveller is counterclockwise, looking down at the spinning ring, or vice versa. This results in laying a twist in the wrapped roving in the same direction as the spiral of the wrapping belices of the filaments F, F. This in turn tightens the wrappings F, and results in a yarn in which the slope of the spiral of the spun rovings severally bears a lesser angle to the axis of the yarn than the corresponding slope of any of the helical wrappers or binders.

I claim:

1. Machine for producing composite yarns having therein, in combination, means for laying a wrapping filament in surrounding relation to an elongate bundle of fibers, means for advancing the wrapped bundle in the direction of its length, and means for thereafter spinning the wrapped bundle of fibers.

2. Machine for producing composite yarns having therein, in combination, rotary means

for laying a wrapping filament in surrounding relation to an elongate bundle of fibers, means for advancing the wrapped bundle in the direction of its length through a predetermined distance during laying of a predetermined number of turns of wrapping filament, and means for thereafter spinning the wrapped bundle of fibers.

3. Machine for producing composite yarns having therein, in combination, rotary means for laying a wrapping filament in surrounding relation to an elongate bundle of fibers, means for advancing the wrapped bundle in the direction of its length through a predetermined distance during laying thereby of a predetermined number of turns of wrapping filament, and means for thereafter spinning a predetermined degree of twist in relation to a certain extent of the advancing movement in the wrapped bundle of fibers.

4. Machine for producing composite yarns having therein, in combination, means for fasciating an elongate bundle of otherwise discrete fibers by laying a wrapping of binding filament exteriorly about such a bundle at a certain slope to the axis of said bundle, and means for spinning a twist in the fasciated bundle at a related rate.

5. Machine for producing composite yarns having therein, in combination, means for fasciating an elongate bundle of otherwise discrete fibers by laying a spiral wrapping of binding filament exteriorly about such a bundle at a certain slope to the axis of said bundle, and means for spinning a twist in the fasciated bundle at a related rate in the same relative direction as the turns of the spiral binding.

6. Spinning frame for producing yarns from rovings of fibers having low capacity to twist together into a permanent aggregate not readily dissociated under tensile stress having therein a spindle and a receiver for spun yarn, means for driving the spindle, means for winding spun material on the receiver and means for guiding and for paying off suitable rovings at a suitable rate in relation to the rate of the spindle, in combination with means for wrapping a binding filament exteriorly about a run of the material to be spun at a rate related to the rate of advance of the material toward the receiver.

7. Spinning frame for producing yarns from rovings of fibers having low capacity to twist together into a permanent aggregate not readily dissociated under tensile stress having therein means for leading a run of roving from a supply source to drawing-off means operated at a certain rate, a wrapping device for rotating a supply of a binding filament about the run of roving at a rate related to the motion of the drawing-off means, whereby to lay a binding about the roving prior to its passage into the drawing-off means, and spinning devices operating on the wrapped roving after its passage by the drawing-off means, whereby to set a twist in the roving and alter the laid pitch of the spirally-laid binding.

8. Spinning frame for producing yarns from rovings of fibers having low capacity to twist together into a permanent aggregate not readily dissociated under tensile stress having therein a guide eye, a spindle and a receiver for spun yarn, winding means imposing different degrees of rotation on a balloon of spinning yarn from the guide-eye and the receiver, and a rotary device for wrapping a binding filament about the roving prior to passage of the guide-eye running at a rate so related to the rate of longitudinal take-up of the yarn as to bind a bundle of said fibers within spiral wrappings of the binding filament spaced longitudinally substantially not further apart than the maximum length of said fibers, and means for driving said rotary device.

9. Machine for producing composite yarns having therein, in combination, means for fasciating an elongate bundle of otherwise discrete fibers by laying a wrapping of binding filament exteriorly about such a bundle at a certain slope to the axis of said bundle, and ring spinning devices for spinning a twist in the fasciated bundle in a direction to tighten the wrapping of binder filament.

10. In a spinning frame, the combination of binder wrapping means for supporting and rotating multiple sources of binding filament about rovings of fibrous material of low capacity to twist together into a yarn, means for leading one or more such rovings axially through the binder wrapping means, means for longitudinally advancing the wrapped roving or rovings during wrapping of a binder, and means for spinning and winding on a receiver yarn so made.

11. In a spinning frame, the combination of binder wrapping means for supporting and constantly rotating in one direction multiple sources of binding filament about rovings of fibrous material of low capacity to twist together into a yarn, means for leading one or more such rovings axially through the binder wrapping means, means for longitudinally advancing the wrapped roving or rovings during wrapping of a binder, and means for spinning the wrapped roving by rotating its end in a direction opposite to the travel of the binding filament sources.

12. In a spinning frame, the combination of a spindle, a receiving bobbin, and spindle and bobbin driving devices with means for supporting and driving a wrapping head and sources of binder filament operative to wrap said binder filament about unspun rovings on their way to said spinning devices.

13. A spinning frame, having therein a support for a supply of roving, a spindle and driving means therefor, a driven roll and

gearing adapted to rotate said roll at a rate related to the revolutions of the spindle, and means for causing the roving to be paid off to the spindle by said roll, in combination with a wrapping head adapted to carry a supply of binding filament about a run of the roving extending toward said roll, and means for rotating the wrapping head at a rate related to the motions of said roll.

14. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions; means for guiding runs of roving severally to said rolls, a series of wrapping heads, one for each spindle, adapted to deliver a binding about roving running to a roll and a spindle, and means common to the series of wrapping heads for driving them in unison at a rate having a constant predetermined relation to the rate of said rolls.

15. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions; means for guiding runs of roving severally to said rolls, a series of wrapping heads, one for each spindle, adapted to deliver a binding about roving running to a roll and a spindle, and gearing common to the said rolls and said wrapping heads for driving these parts at predetermined relative rates.

16. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions, means for guiding runs of roving severally to said rolls, a series of wrapping heads, one for each spindle, adapted to deliver a binding about roving running to a roll and a spindle, and means for driving the spindles and wrapping heads, and means for simultaneously stopping motion of a wrapping head and a spindle cooperating with said wrapping head.

17. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions, means for guiding runs of roving severally to said rolls, a series of wrapping heads, one for each spindle, adapted to deliver a binding about roving running to a roll and a spindle, and means for driving the spindles and wrapping heads, and means for simultaneously stopping motion of a wrapping head and a spindle cooperating with said wrapping head, said means permitting resumption of driving motion at the spindle during stoppage of the winding head.

18. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions, means for guiding runs of roving severally to said rolls, a top roll for maintaining driving contact between rovings and the driven roll for each spindle, and a series of wrapping heads each delivering a fasciating binding about roving at or above the top roll.

19. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions, means for guiding runs of roving severally to said rolls, a top roll for maintaining driving contact between rovings and the driven roll for each spindle, a series of wrapping heads each delivering a fasciating binding about roving at or above the top roll, and means for stopping a spindle and lifting its top roll simultaneously.

20. In a spinning frame, the combination of a series of spindles and means for rotating said spindles, a series of operated rolls, one at each spindle, connected together to be driven in unison at a rate related to the spindle revolutions, means for guiding runs of roving severally to said rolls, a top roll for maintaining driving contact between rovings and the driven roll for each spindle, a series of wrapping heads each delivering a fasciating binding about roving at or above the top roll, and means for stopping a spindle and its winding head and for lifting its top roll simultaneously.

21. In a spinning frame having therein a roving guide, a winding head, a pay-off mechanism having a driven and a removable top roll, and driving means for said winding head, pay-off roll and spindle respectively, means for breaking the driving connection to the winding-head, stopping the spindle and lifting the top roll simultaneously.

22. In a spinning frame having therein a roving guide, a winding head, a pay-off mechanism having a driven and a removable top roll, and driving means for said winding head, pay-off roll and spindle respectively, means for breaking the driving connection to the winding-head, stopping the spindle and lifting the top-roll simultaneously, having as an element a manually operated lever, cam and brake for stopping and then releasing the spindle.

23. In a spinning frame having therein a roving guide, a winding head adapted to be clutched to and disconnected from driving means therefor, a pay-off mechanism having a driven and a removable top roll, and driving means for said pay-off roll and spindle respectively, connected means for releasing the

Machine for Spinning Composite Yarns (US Patent 1,732,592, 1929)
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clutch driving connection to the winding head, stopping the spindle and lifting the top roll simultaneously on manual operation.

24. In a spinning frame, devices for fasciating a loose fibrous roving by a binding wrapping having in combination with a pay-off roll mechanism upon an element of which the roving contacts, means for rotating a binding filament about a part of the roving running to said point of contact.

25. In a spinning frame, devices for fasciating a loose fibrous roving by multiple binding wrappings having in combination with a pay-off roll mechanism, with an element of which the roving contacts, means for rotating a plurality of delivery guides for binding filaments severally supplied thereto about a part of the roving running to said point of contact, whereby the binding filaments contact with and wrap about the roving at said point of contact in separate interleaved spiral relation.

26. In a spinning frame, a wrapper head and a movable clutch element for driving or releasing said head, a top roll and a lifting element for same, in combination with a connection for simultaneously lifting the top roll and working the clutch element.

27. In a spinning frame, in combination with a series of spindles and driving means severally therefor, a series of winding heads supported above the spindles, a bracket for each winding head having therein bearings for a rotary element of the winding head, a housing for a driving connection providing a hole for a driving shaft therefor, and a driving shaft for the said winding heads made in sections connected by universal motion couplings.

Signed by me at Manville, N. J., this 18th day of June, 1928.

PHILLIP D. CANNON.

CERTIFICATE OF CORRECTION.

Patent No. 1,732,592. **Granted October 22, 1929, to**

PHILLIP D. CANNON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 16, for the word "spurn" read "spun", and line 80, for the word "by" read "be"; page 3, line 127, for the misspelled word "warpping" read "wrapping"; page 4, line 95, for the word "placid" read "placed", and line 109, for "roving" read "rovings"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of December, A. D. 1929.

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