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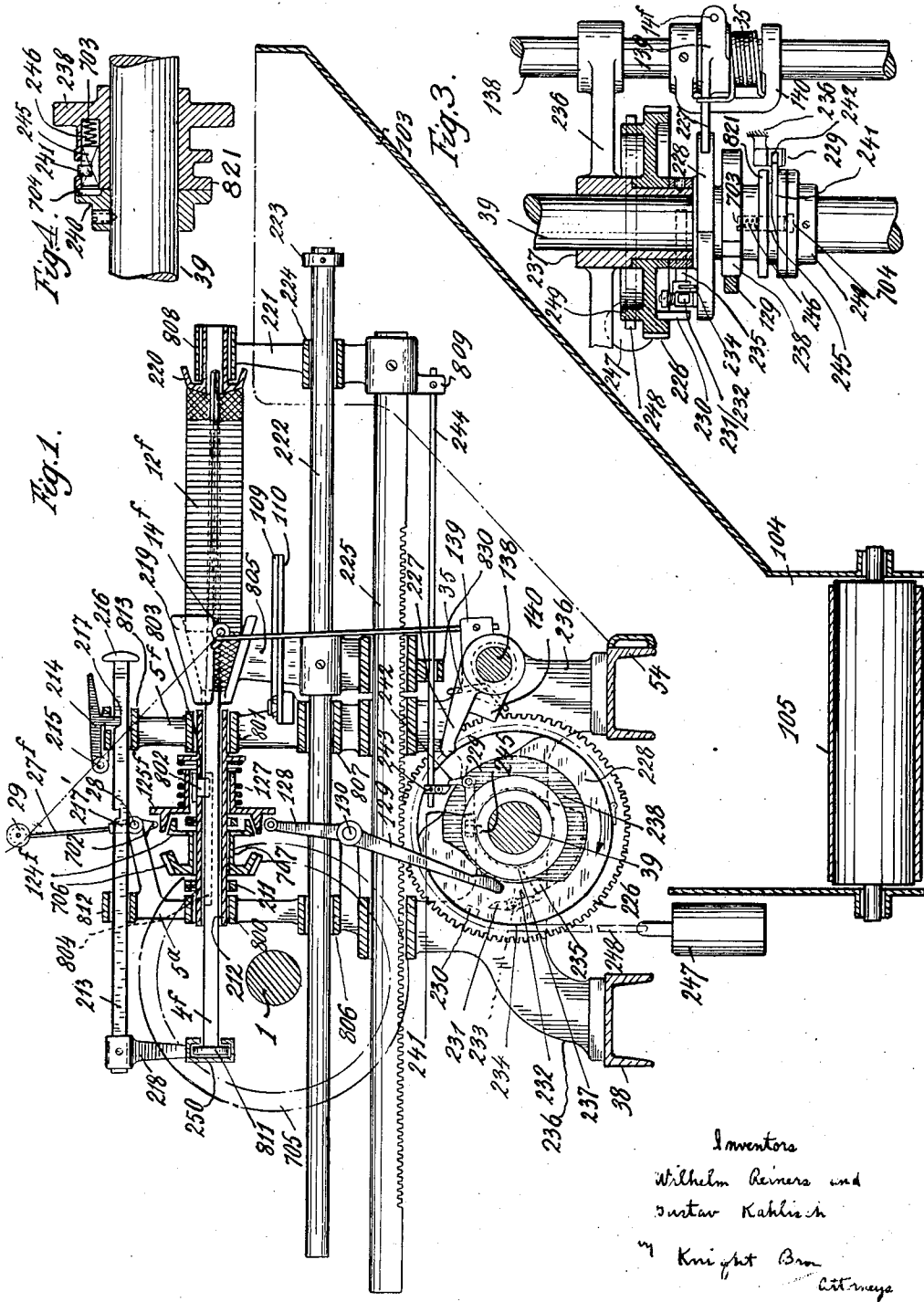
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2,209,208

COP WINDING MECHANISM

Original Filed March 27, 1936

5 Sheets-Sheet 1



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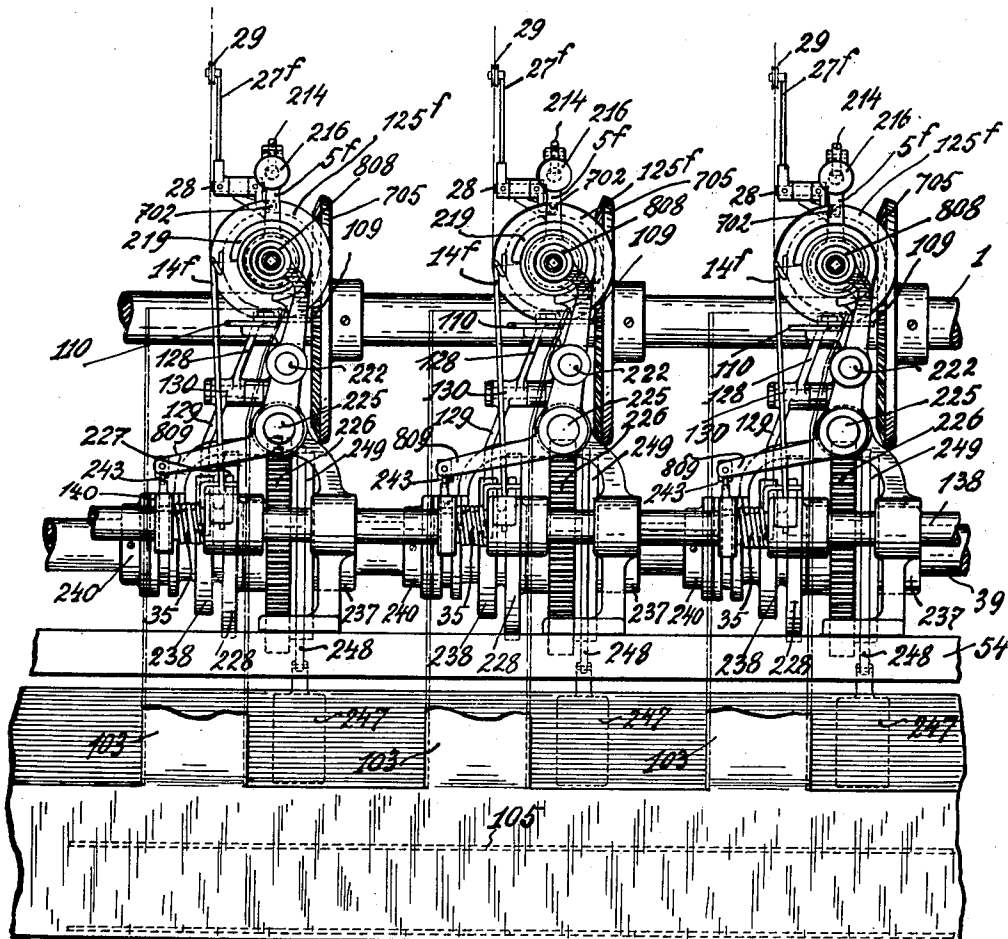
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5 Sheets-Sheet 2

Fig. 2



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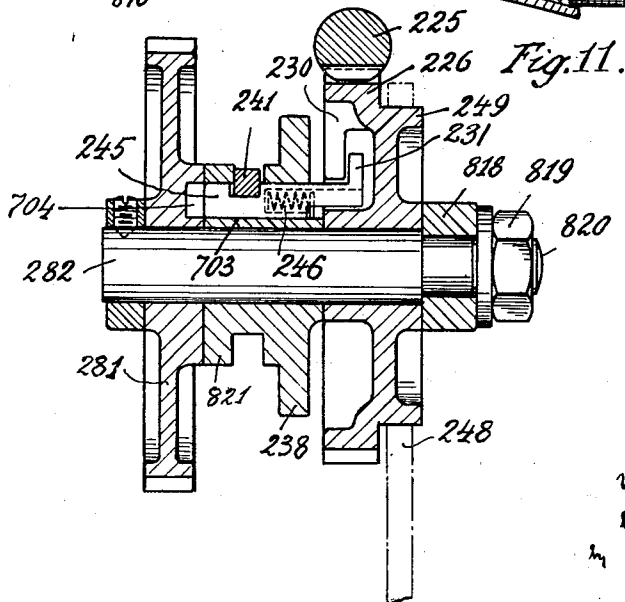
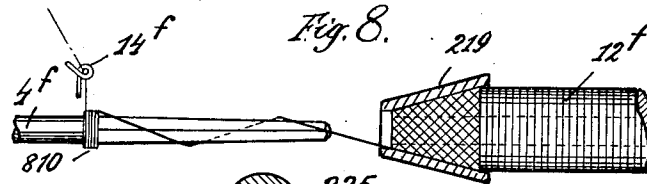
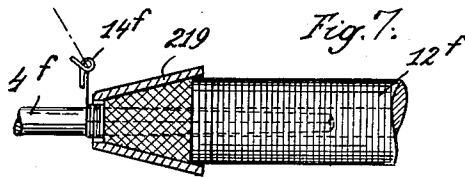
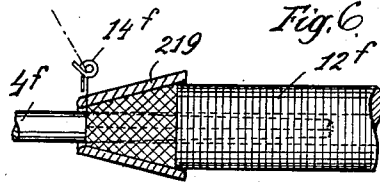
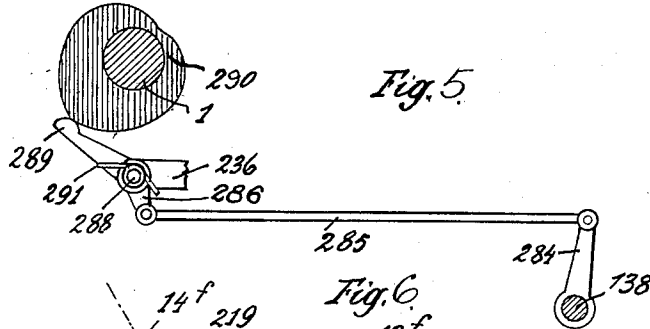
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COP WINDING MECHANISM

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5 Sheets-Sheet 3



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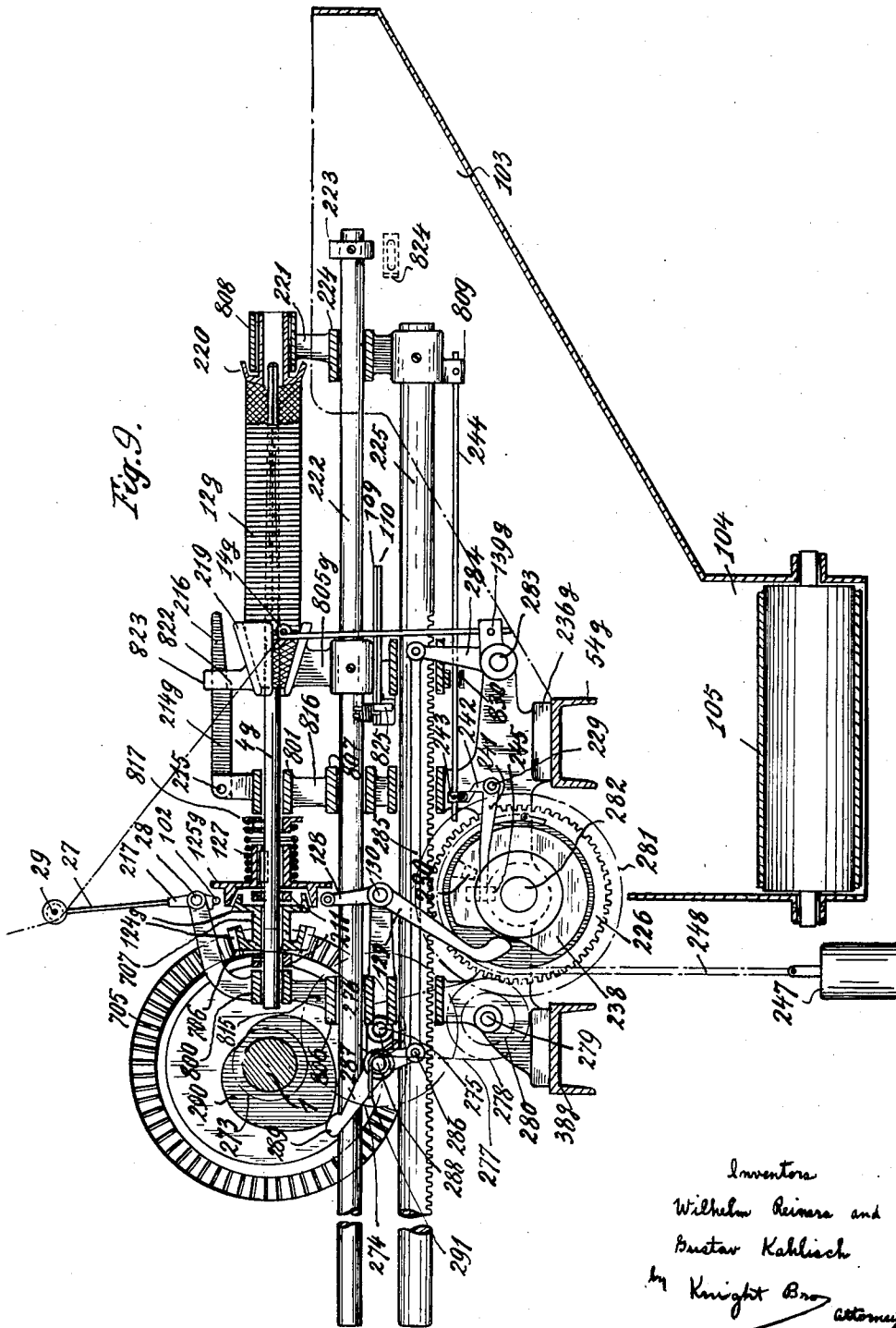
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COP WINDING MECHANISM

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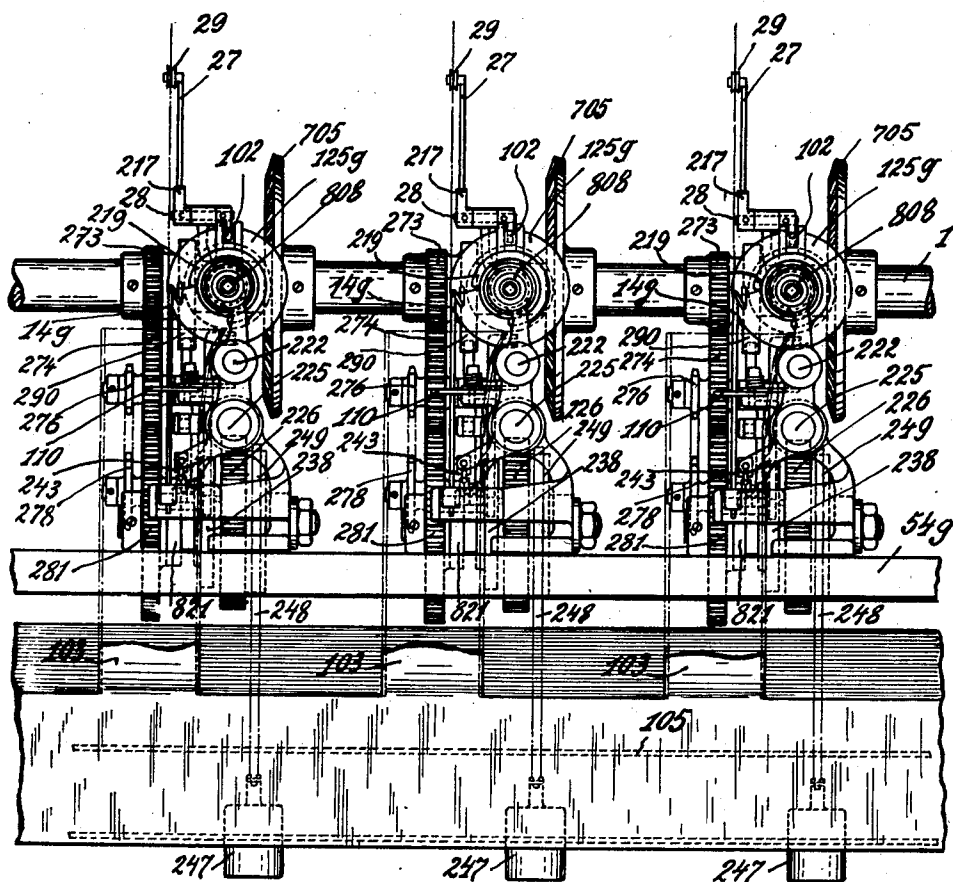
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COP WINDING MECHANISM

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Fig. 10



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UNITED STATES PATENT OFFICE

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COP WINDING MECHANISM

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Original application March 27, 1936, Serial No. 71,266. Divided and this application December 31, 1937, Serial No. 182,690. In Germany April 2, 1935

6 Claims. (Cl. 242—32)

This invention relates to a fully automatic machine for winding cops and is a division of our copending application, Serial No. 71,266, filed March 27, 1936. The present application covers one of the several types of automatic machines in which the broad invention disclosed in the said copending application can be embodied, namely, a machine for producing tubeless cops.

The invention is illustrated by two embodiments in the accompanying drawings, wherein

Fig. 1 is a side elevation, partly in section, of a winding machine embodying the invention;

Fig. 2 is a front elevation of the machine shown in Fig. 1, with parts broken away to expose portions lying behind;

Fig. 3 is a fragmentary plan view of part of the control mechanism for the automatic operation of the machine, with parts in section;

Fig. 4 is an axial section of the cam and clutch unit shown in Fig. 3;

Fig. 5 is a detail side elevational view of the mechanism for rocking the shaft which controls the traverse of the thread;

Figs. 6, 7, and 8 are detail views showing three stages in the winding of a cop;

Fig. 9 is a side elevation, partly in section, of another embodiment of the invention;

Fig. 10 is a front elevation of the machine shown in Fig. 9, with parts broken away to expose portions lying behind; and

Fig. 11 is an axial section of a clutch and control mechanism forming a part of the machine shown in Fig. 9.

Figs. 1 to 4 will be described first. There may be as many spindles as desired in one machine, all of them, or a group of them being driven from one shaft. Each spindle 4f is slidably mounted in a sleeve 212, which is rotatably supported in bearings 800, 801 of posts 5a and 5f, respectively. The spindles are driven by a main drive shaft 1 through bevel gears 705 and 706. Each gear 706 is fixed upon the hub 707 of a clutch cone 124f rotatably mounted upon sleeve 212 and held against axial movement thereon by fixed collars 211. Cooperating with the clutch cone 124f is a clutch cone 125f mounted by its hub for limited sliding movement on the sleeve 212. A spring 127 urges the clutch cone 125f toward the clutch cone 124f. The cone 125f is keyed to spindle 4f by a key 802 fixed to the hub of the cone 125f and extending through a slot 803 in sleeve 212 into a key groove 804 in spindle 4f. The clutch can be released by automatic means, to be described presently, to stop the rotation of the spindle 4f.

In this type of machine the thread is wound directly on the spindle, the wound body being pushed along the spindle to build it axially as the winding proceeds. The threads are guided to the spindles through thread guides 14f each carried by a bracket 139 loosely mounted on shaft 138. The brackets 139 have a limited rocking movement with respect to the shaft 138, each under the control of a spring 35, one end of which bears upon an arm 227 of bracket 139, while the other engages under a yoke 140 fixed upon shaft 138. The shaft 138 has a rocking motion imparted to it by any suitable means, such as the cam mechanism shown in Fig. 5. This comprises a heart cam 290 fixed on shaft 1, a rock lever 289, 286 pivoted at 288 on the frame 236 and held against the cam by a spring 291, a link 285, and an arm 284 fixed on shaft 138. The rocking movement of shaft 138 is imparted through yokes 140, springs 35, and arms 227, to the brackets 139 and thread guides 14f during the winding process, to provide the traverse movement for cross winding the threads. The rocking of the thread guides can be interrupted by cams 228 on shaft 39, which are brought to bear against arms 227 at the time the cop is being doffed, the springs 35 then absorbing the rocking movement of shaft 138.

Surrounding each spindle 4f at the traverse zone of the thread guide 14f is a builder cone 219 mounted on a post 805. The post 805 is fixed to a shaft 222 slidably supported in bearings 806, 807 of posts 5a, 5f, respectively. The builder cone 219 stands in the position shown in Fig. 1 during the winding operation. As the thread is cross wound under the cone 219, the chase of the cop is shaped by the cone and the increasing bulk of thread accumulating under the cone is wedged to the right along the spindle, because the force which it exerts against the cone has a component parallel to the axis of the spindle. In order to compact the windings of the cop a pressure is exerted against it by a tail stock comprising a thimble 220 rotatably mounted in a bearing 808 of a post 221. Each post 221 is slidably guided by a bearing 224 upon shaft 222 and is connected at its lower end to a rack bar 225, which meshes with a gear 226. The gears 226 are rotatably mounted upon shaft 39 and each has a flange 249 (Fig. 3) upon which is wrapped a cord 248 supporting a weight 247, which tends to rotate the gear 226 in counter-clockwise direction, thus applying a pressure to the building cop through the tail stock 221, 220.

The tail stocks move to the right along shafts 222 as the cops build up.

The automatic doffing of the completed cops and the starting of the new ones are controlled by mechanisms mounted upon shaft 39, this shaft being constantly driven by means not shown. One of these mechanisms is shown in detail in Figs. 2 and 3. A cam unit comprising a flange 821 and cams 228, 238, is revolvably mounted upon shaft 39. The cam unit has a recess 703 in which is held a sliding dog 245. A spring 246 within the recess 703 urges the dog 245 toward a flange 240 fixed on shaft 39, the flange having a notch 704 to receive the end of the dog, for clutching the cam unit to the rotating flange 240. During the winding operation, the dog 245 is held retracted from notch 704 by the wedge-shaped arm 241 of a bell crank lever 241, 242 pivotally mounted by a pin 229 on the frame 236. The arm 241 releases the dog 245 when the cop being wound on the appurtenant spindle attains its prescribed length, through the action of a dog 243 on the end of a rod 244 fixed to a boss 809 on post 221 and guided in a bearing 830. During the revolution of the cam unit which follows, rod 244 is moved outward to such an extent, in a manner to be described presently, that dog 243 passes over arm 242, and arm 241 drops back into position to release clutch dog 245 after one revolution of the cam unit. Shortly after the cam unit has begun its revolution the cam 238 operates a lever 129, 128 pivoted at 130 to an arm of post 5a, to throw out of engagement the clutch disc 125f of the appurtenant spindle 4f, so that the spindle is stopped during the process of doffing the completed cop. The cam 228 comes into engagement with arm 227 of bracket 139 shortly after the cam unit is set in operation, to stop the traverse movement of the thread guide 14f.

The doffing of the cop is accomplished by moving the tail stock away from the end of the cop and pushing the cop off the spindle by means of the builder cone 219. For this purpose, the gear 226 is temporarily coupled to the cam unit 228, 238 by means of a dog 231, 232, pivoted at 233 on the cam 228. This dog is under the influence of a spring, tending to rock the dog counterclockwise, as seen in Fig. 1, so that its lower leg rests upon a cam 235. This is a stationary cam fixed upon an extension of bearing 237 on frame 236. As soon as the cam 228 begins its rotation, through the action of the clutch previously described, the lower arm of dog 231, 232 leaves the cam 235 and the dog swings out into engagement with a lug 230 on gear 226. The gear is therefore carried around with the cam unit in its rotation and thus slides the rack bar 225 to the right. At the beginning of this movement of the rack bar, the tail stock 220, 221 separates from the end of the cop body and shortly thereafter the bearing 224 comes to abut against the collar 223 fixed on shaft 222, following which the latter shaft is moved together with the rack bar 225 in its further travel to the right. This movement continues until the builder cone 219 has pushed the cop over the end of spindle 4f, so that it drops into chute 103 which guides it onto a conveyor 105 mounted in a box 104. The release of the cop from the spindle occurs just before the arm 232 of the dog 231, 232 comes into engagement with cam 235, which releases the dog from lug 230. Thereupon the weight 247 revolves the gear 228 counterclockwise, moving the rack bar 225 to the left, which first brings bearing 224 into abutment with post 805 of the builder cone 219 and there-

after moves both the tail stock and the builder cone together to their extreme left position.

In accordance with the invention preparation is made for the winding of a new cop on each spindle before a finished cop is doffed therefrom. The manner in which this is carried out will be explained by reference to Figs. 6-8. It has been stated that the operation of the cam 238, which disengages clutch 124f, 125f, and stops the spindle is delayed somewhat after the cam unit begins its rotation; likewise, with the action of cam 228, which stops the traverse motion of the thread guide 14f. The purpose of this lag is to permit a small amount of thread to be wound on the spindle beyond the nose of the cop, so as to hold the thread in readiness for the beginning of winding of the next cop. Fig. 6 shows the cop 12f just completed. Fig. 7 shows the cop shifted slightly beyond the traverse of the thread guide by the builder cone 219, resulting in the winding of a small bunch of thread 810 on the bare spindle. Fig. 8 shows the cop pushed entirely beyond the end of the spindle, with its trailing thread drawn out and still attached to the bunch of thread 810. The cams 228 and 238 come into action at about the position shown in Fig. 7, with the result that the spindle 4f and thread guide 14f do not move between the positions of Figs. 7 and 8. When the cop slides down chute 103 onto the conveyor 105 the trailing thread is carried between the jaws 109, 110 of a pair of shears. These shears may be operated automatically in any suitable way to cut the thread, for instance, by the camming action of post 805 on its return to the position shown in Fig. 1. When the builder cone 219 is restored to the position shown in Fig. 1 it passes over the small bunch of thread 810 left on spindle 4f and the winding of the new cop begins on this bunch when the clutch 124f, 125f, is reengaged by the release of lever 129, 128, by cam 238. The release of thread guide 14f by cam 228 takes place at the same time. The winding of the cops therefore proceeds in a fully automatic manner.

In case of thread breakage, it is desirable to be able to remove the chase of the cop from builder cone 219. This can be done by the manipulative mechanism shown in Figs. 1 and 2. The end of spindle 4f bears a round knob 811, which is received in a socket 250 mounted by an arm 218 upon a rod 213. The rod 213 is slidably supported in bearings 812 and 813 at the top of posts 5a and 5f respectively. The spindle 4f and rod 213 are normally urged to the left by the pull of weight 247 acting through the tail stock on the cop. A pawl 214 pivoted at 215 on bearing 813 engages a notch 217 of rod 213 to hold the parts normally in the position shown in Fig. 1. When it is desired to move the cop out of the cone 219 the knob 216 of rod 213 is grasped and pulled to the right, thus camming pawl 214 out of notch 217. The rod 213 may be pulled far enough to the right to allow pawl 214 to drop into notch 217', which locks the parts and allows the operative to examine the chase of the cop to find the broken end. After knotting the thread the cop is restored to the builder cone 219 by lifting pawl 214 and allowing the spindle 4f to move back into the position shown in Fig. 1. A detector 27f pivoted at 28 on an arm of post 5a bears a roller 29 which rests upon the thread during the winding operation. If the thread breaks the detector drops toward the left and a pin 702 on its projecting lower end engages the

flange of clutch cone 125f and disengages the clutch.

The winding machine described is operated as follows:

5 To set the machine in operation each yarn is threaded under the thread detector roller 29 and through thread guide eye 14f, then tied to the spindle 4f. The drive of shaft 1 is then started and the spindles rotate. Each cam 228 is in the position shown in Fig. 1 and the thread guides 14f are therefore free to rock by the action of shaft 138. The yarn is thus laid on each spindle in a cross wound body, which builds up under the cone 219. When the periphery of the body is large enough to bear against the cone the body is pushed toward the right along the spindle and begins to take the form of a cop, the chase of the cop being shaped in this process by the cone 219. The rightward movement of the wound body pushes the tail stock 220, 221, to the right, against the action of weight 247. When any cop has reached a certain length the corresponding dog 243 rocks the bell crank lever 241, 242, and releases the dog 245, thus engaging the cam unit 25 821, 238, 228, with the flange 240 fixed to constantly rotating shaft 239. The first movement of the cam unit removes the dog 231, 234, from cam 235, so that it turns out in position to strike the lug 230 on gear 226. The gear 226 then drives 30 shaft 225 toward the right and removes tail stock 220, 221, from the end of the cop. The bearing 224 soon strikes collar 223 on shaft 222 and this shaft then moves to the right with the shaft 225. Thereby the cone 219 pushes the cop 12f along the spindle 4f. Meanwhile the spindle has continued to rotate and when the cop is moved to the right a small amount of yarn is wound upon the bare spindle (Fig. 7). At this time the cam 238 rocks lever 129, 128 to throw out clutch 125f and stop the spindle. Also the cam 228 rides under arm 227 of the thread guide and stops the rocking of the latter. The movement of the cone 219 to the right continues until the cop is pushed off the end of the spindle (Fig. 8), when it is stopped by the dog 234, 231 striking cam 235 and disconnecting the gear 226 from the cam unit 821, 238, 228. The cop drops into the chute 103, which guides it to conveyor 105, the trailing yarn passing between the blades of shears 109, 110. As soon as the dog 231, 234 is released the weight 247 moves the rack bar 225 to the left and bearing 224 striking against post 805 moves the latter to the left until cone 219 assumes the position shown in Fig. 1. On its return movement the arm 805 cams the shear blade 109 and severs the trailing yarn. The continued rotation of cam unit 821, 238, 228 leads to the release of lever 129, 128 and the reengagement of clutch 125f; and to the release of arm 227, which permits the thread guide 14f to take up its rocking motion again. The winding of the new cop thus proceeds automatically.

In the machine first described there are three shafts common to all the spindles of the group, namely, drive shaft 1, cam shaft 39, and thread guide rock shaft 138. It may be desirable to take off the power for each winding station individually, either from a special shaft, or from a separate motor, or from one of the shafts common to the group of spindles. An example of this construction is shown in Figs. 9 and 11, wherein the drive for the control mechanism of each individual spindle is independently taken off from a main drive shaft 1. There may be as many spindles as desired in a group. Each spindle 4g is rotatably 75 mounted in bearings 800, 801, of posts 815, 816,

respectively. The spindle has keyed to it one cone 125g of a clutch, the other cone 124g being rotatably mounted on the spindle by its hub 707 and held against axial movement thereon by collars 211. The hub 707 bears a bevel gear 706 8 meshing with a bevel gear 705 fixed upon drive shaft 1. The clutch cone 125g is pressed into contact with cone 124g by a coil spring 127, the opposite end of which abuts against a collar 817 fixed to spindle 4g. The collar 817 and the left-hand collar 211 prevent axial movement of spindle 4g in bearings 800, 801.

The thread is guided to each spindle through a thread guide 14g carried by a bracket 139g pivoted at 283 upon a frame 236g. An arm 284 rigid 15 with bracket 139g is connected by a link 285 to a rock lever 286, 287. This lever is pivoted at 288 upon the frame of the machine and its end 289 is pressed against a heart cam 290 on shaft 1 by a spring 291. By this mechanism the thread guide is rocked to traverse the thread so that it will be cross wound upon the spindle. Surrounding the spindle 4g is a builder cone 219 mounted upon a post 805g fixed to a shaft 222. The shaft is guided for longitudinal movement in bearings 800 25 and 807 in posts 815, 816, respectively. A tail stock comprising a thimble 220 rotatably mounted in a bearing 808 on a post 221 serves to apply a pressure to the cop 12g to compact it. For this purpose the post 221 is slidably guided by a bearing 224 upon shaft 222 and is connected at its lower end to a rack bar 225 meshing with a gear 226. This gear is rotatably mounted upon a short shaft 282 fixed to a bearing 818 of frame 236g by a nut 819 screwed onto its threaded end 820. 35 The gear 226 has a flange 249 around which is wrapped a cord 248 which bears at its lower end a weight 247. The weight tends to rotate the gear 226 counterclockwise, which pulls the rack bar 225 and tail stock 221, 220 to the left. 40

The mechanism for controlling the automatic doffing of the completed cops is mounted upon shaft 282. A gear 281 rotatably carried by this shaft meshes with a gear 280, which is supported by a shaft 275 upon frame 236g. Fixed to gear 280 is a sprocket 278 connected by a chain 277 45 to a sprocket 276 rotatably mounted upon a shaft 275 on post 815. The sprocket 276 has fixed to it a gear 274 which meshes with a gear 273 fixed to drive shaft 1. By this mechanism the gear 50 281 is constantly driven. Rotatably mounted on shaft 282 beside gear 281 is a cam unit comprising a flange 821 and a cam 238. Guided in a recess 703 of the cam unit is a sliding dog 245 urged to the left by a spring 246. The gear 281 55 has a recess 704 adapted to receive the end of the dog 245 when it moves to the left. The dog is held to the right during the winding operation by an arm 241 of a bell crank lever pivoted at 229 on the frame 236g. The other arm 242 of the bell crank lever cooperates with a dog 243 fixed upon a rod 244, which is secured to a boss 809 on post 221 and guided in a bearing 839. When the cop 12g attains the prescribed length 65 the dog 243 trips bell crank lever 242, 241 and releases dog 245, which couples cam unit 821, 238, to constantly rotating gear 281. The dog 243 passes over arm 242 in a subsequent movement of the post 221 to the right and allows the 70 lever arm 241 to drop back into position to release the dog 245 after one revolution of the cam unit. Shortly after the cam unit begins its revolution cam 238 rocks bell crank lever 129, 128, pivoted at 130 on a projection of post 815, and 75

disengages clutch 124g, 125g, thus stopping the rotation of the spindle.

The doffing of the cop is accomplished by moving the tail stock away from the end of the cop and pushing the cop off the spindle by means of the bullder cone 219. For this purpose the gear 226 is temporarily coupled to the cam unit 221, 230, by means of a finger 231 projecting from dog 245. When the dog 245 is held to the right by arm 241, the finger 231 is positioned out of the plane of a lug 230 on gear 226. When the dog 245 moves to the left, the finger 231 comes into the plane of lug 230 and engages the same when the cam 230 is revolved. The gear 226 is therefore carried around with the cam unit in its rotation and slides the rack bar 225 to the right. The doffing operation is thus carried out in the same way as in the machine shown in Fig. 1.

During the winding operation the bullder cone 219 is held in the position shown in Fig. 9 by a dog 214g pivoted at 215 on the post 816 and bearing by a shoulder 822 against a post 823 on cone 219. In case of thread breakage the lever 214 can be lifted by grasping handle 216, thus allowing the bullder cone to be pushed back from the chase of the cop, which enables the operative to find the broken end. The cop 12g during this operation is held against movement to the left by the taper of the spindle. A thread breakage detector 27 is pivoted at 28 on an arm of post 816 and carries a grooved roller 29 resting upon the thread. If the thread breaks, the detector drops to the left and a pin 702 on its lower end releases clutch 124g, 125g.

The trailing end of thread from the doffed cop can be severed automatically by shears 109, 110. These may be actuated by a lug 824 on chute 103 adapted to engage an arm 825 of the upper shear blade 109 when the post 805g moves to its extreme right end position.

We claim:

1. In a machine for winding tubeless cops, a spindle member, means for rotating said spindle member, a yarn guide member adjacent said spindle member, means for moving one of said members back and forth with respect to the other in a direction generally parallel to the axis of said spindle, in order to traverse the yarn; means for pushing the winding body gradually away from the field of traverse, in the direction of the axis of the spindle, in order to build the body into the form of a cop; means for doffing the cop from the spindle; means operable in response to the attainment of a given length by the cop for setting said doffing means in operation; means for severing the yarn trailing from the doffed cop; and means for fixing said trailing end to the spindle before the operation of said severing means.

2. In a machine for winding tubeless cops, a spindle member, means for rotating said spindle member, a yarn guide member adjacent said spindle member, means for moving one of said members back and forth with respect to the other in a direction generally parallel to the axis of said spindle, in order to traverse the yarn; means for pushing the winding body gradually away from the field of traverse, in the direction of the axis of the spindle, in order to build the body into the form of a cop; means acting automatically in response to the attainment of a given length by the cop to push the completed cop off the spindle while the latter continues to rotate to begin the winding of a new cop on the spindle

behind the completed cop; and means for severing the yarn between the completed cop and the first windings of the new cop on the spindle.

3. In a machine for winding tubeless cops, a spindle member, means for rotating said spindle member, a yarn guide member adjacent said spindle member, means for moving one of said members back and forth with respect to the other in a direction generally parallel to the axis of said spindle, in order to traverse the yarn; means for pushing the winding body gradually away from the field of traverse, in the direction of the axis of the spindle, in order to build the body into the form of a cop; means acting automatically in response to the attainment of a given length by the cop to push the completed cop off the spindle while the latter continues to rotate to begin the winding of a new cop on the spindle behind the completed cop; means acting automatically to stop the rotation of the spindle from a time when a small bunch of the new cop has been wound upon the spindle and the previously completed cop has been pushed off the spindle; and means for severing the yarn between the completed cop and said bunch.

4. In a machine for winding tubeless cops, a spindle member, means for rotating said spindle member, a yarn guide member adjacent said spindle member, means for imparting a relative movement to said members to traverse the yarn; a bullder device adapted to bear at an angle upon the rear end of the winding on the spindle to form it into a conical nose and to push the winding along the spindle to cause it to build axially into the form of a cop; means acting automatically when the cop attains a certain length, to move said bullder device along the spindle so as to push the cop off the spindle, and then to restore said bullder device to said initial position; means acting automatically to stop the rotation of said spindle from a time shortly after said bullder device has begun its movement until it has been restored, whereby a reserve bunch of yarn is wound on the spindle behind the completed cop before the spindle stops; and means for severing the yarn between said bunch and the completed cop.

5. In a machine for winding tubeless cops, a drive shaft, a plurality of spindle members, driving connections including clutches for individually driving said spindle members by said drive shaft, yarn guide members respectively associated with said spindle members, means for relatively moving said members to traverse the yarns, means associated with each spindle for shifting the wound bodies along the spindles as the windings are laid on to cause them to build axially into the form of cops, individual devices associated with each spindle including means controlled independently by the progress of the winding on the respective spindles for pushing the completed cops off the spindles when they reach a prescribed length, means for stopping each spindle independently during a time beginning shortly after the associated pushing means begins to act and ending after the cop has been doffed, whereby the winding of a new cop is begun on each spindle behind the completed cop before the latter is doffed, and means to sever the trailing yarns from the doffed cops.

6. In a machine for winding tubeless cops, a drive shaft, a plurality of spindle members, driving connections including clutches for individually driving said spindle members by said drive shaft, yarn guide members respectively associ-

ated with said spindle members, means for relatively moving said members to traverse the yarns, means associated with each spindle for shifting the wound bodies along the spindles as the windings are laid on to cause them to build axially into the form of cops, individual control units associated with the respective spindles, constantly operating driving means normally disconnected from said control units, means controlled by the progress of the winding on the individual spindles for individually coupling said control units to said driving means, means operated by the individual control units for pushing

the cops off the respective spindles, means operated by the individual control units for stopping the respective spindles during a time beginning shortly after the respective pushing means has begun to act and ending after the respective completed cop has left its spindle, whereby each spindle winds a small bunch of reserve yarn behind the completed cop before it stops, and means for severing each yarn between said bunch and the completed cop. 5 10

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