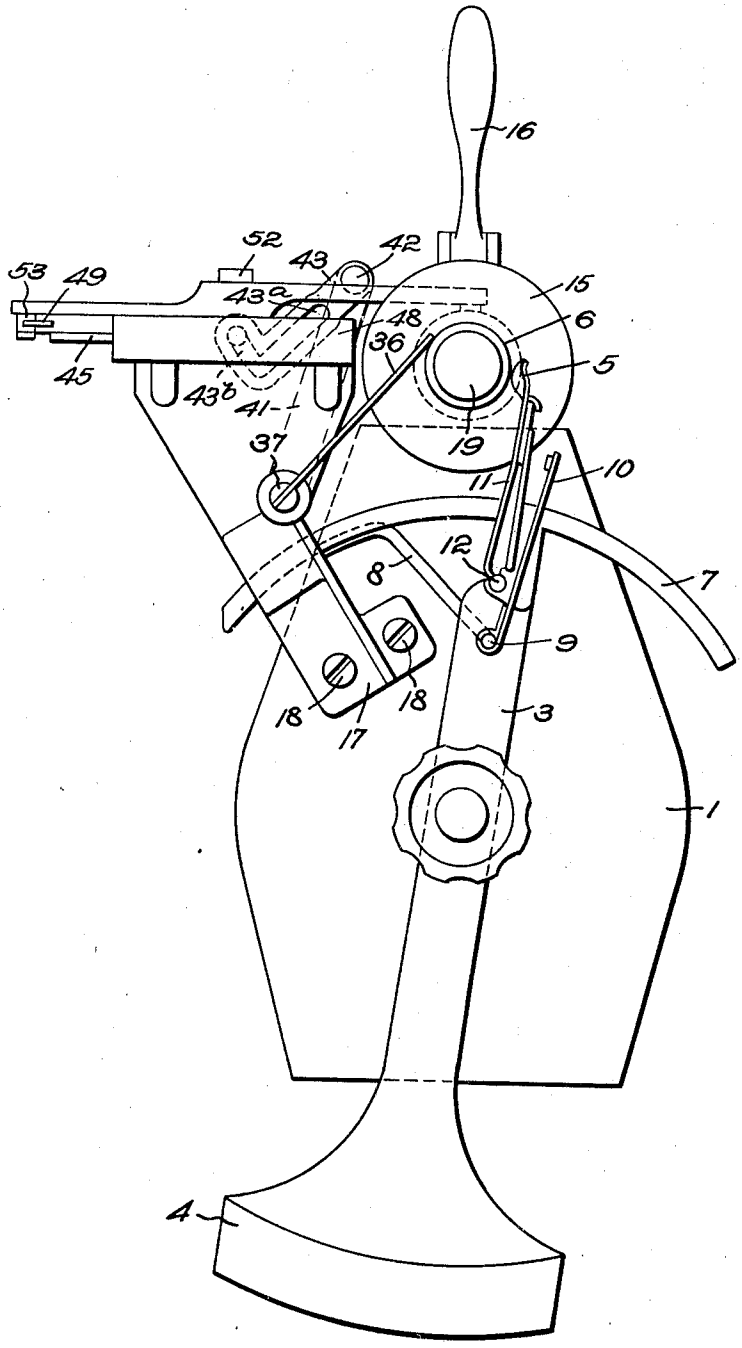
April 3, 1934. G. P. BOSWORTH 1,953,641

STRAND WINDING MACHINE

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Fig. 1.



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STRAND WINDING MACHINE

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Fig. 2.

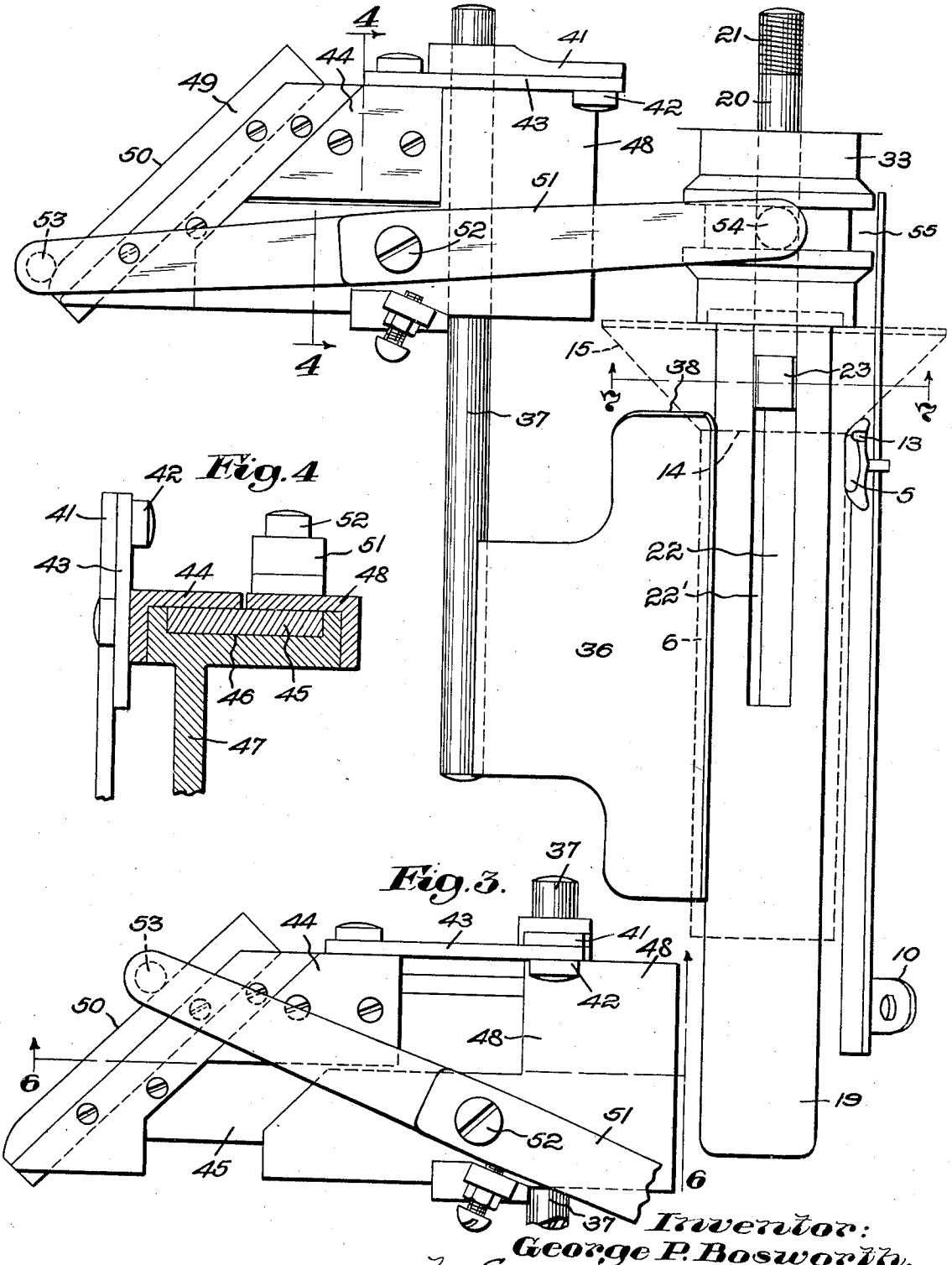


Fig. 4

Fig. 3.

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April 3, 1934. G. P. BOSWORTH 1,953,641

STRAND WINDING MACHINE

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Fig. 5.

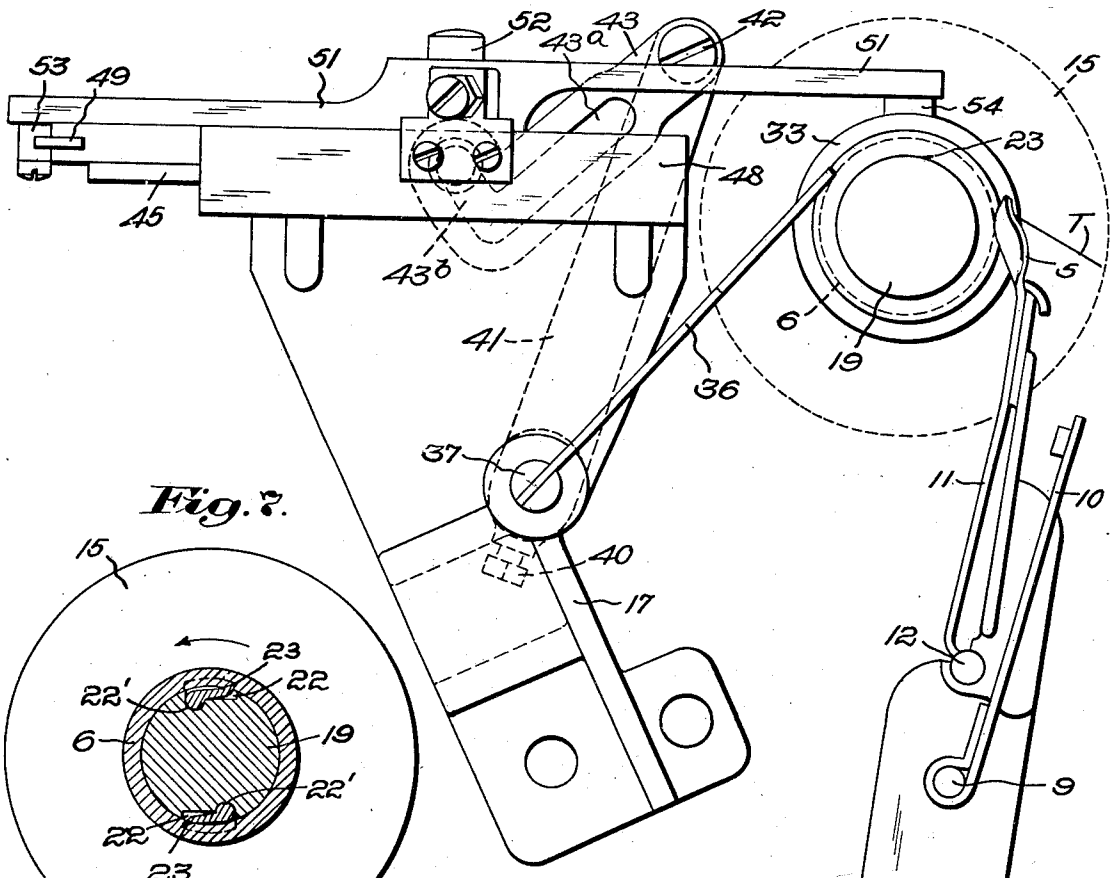
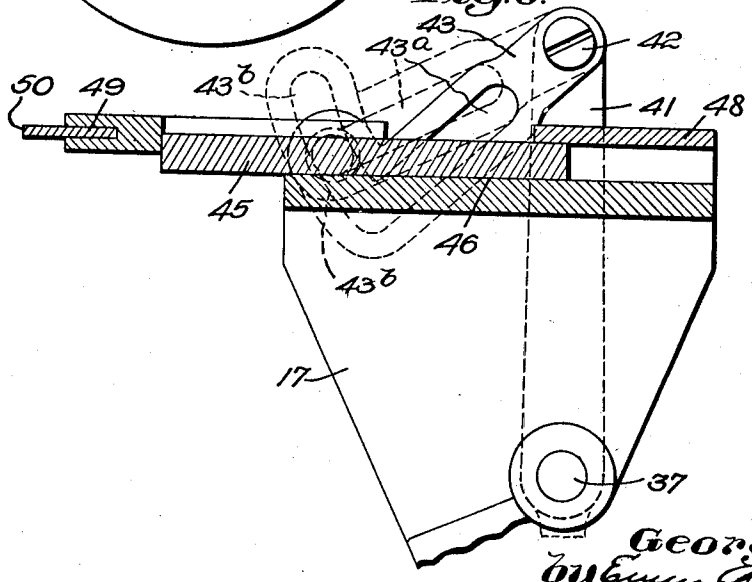


Fig. 7.

Fig. 6.



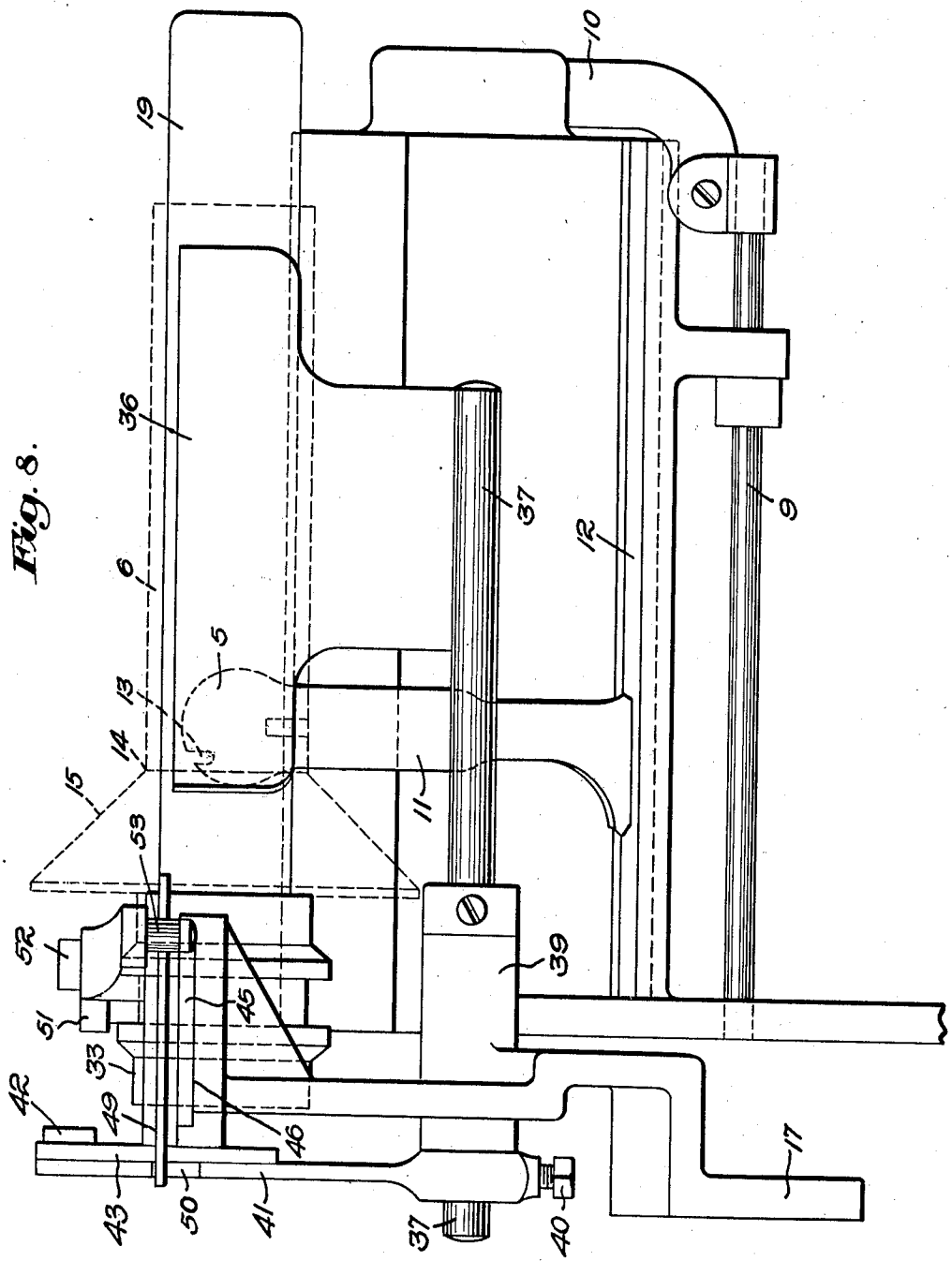
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STRAND WINDING MACHINE

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Fig. 8.



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STRAND WINDING MACHINE

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Fig. 9.

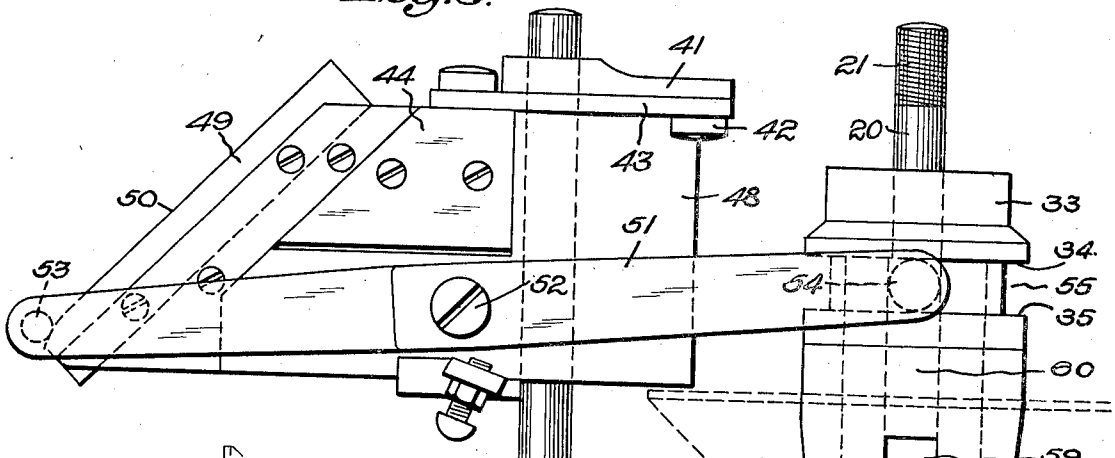


Fig. 11.

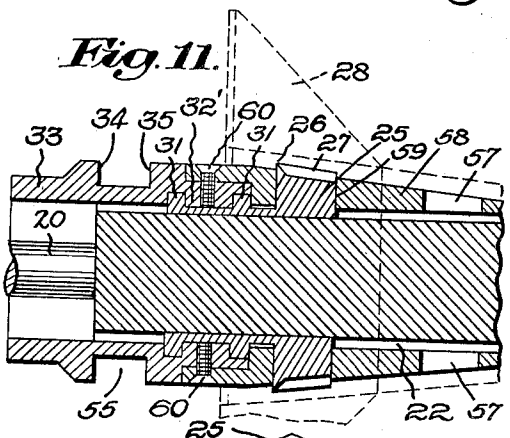


Fig. 12.

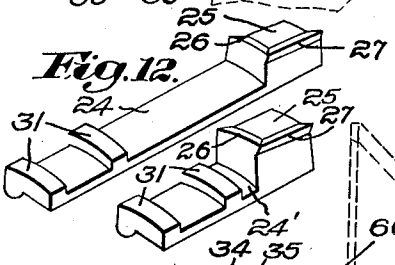


Fig. 10.

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STRAND WINDING MACHINE

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Fig. 13.

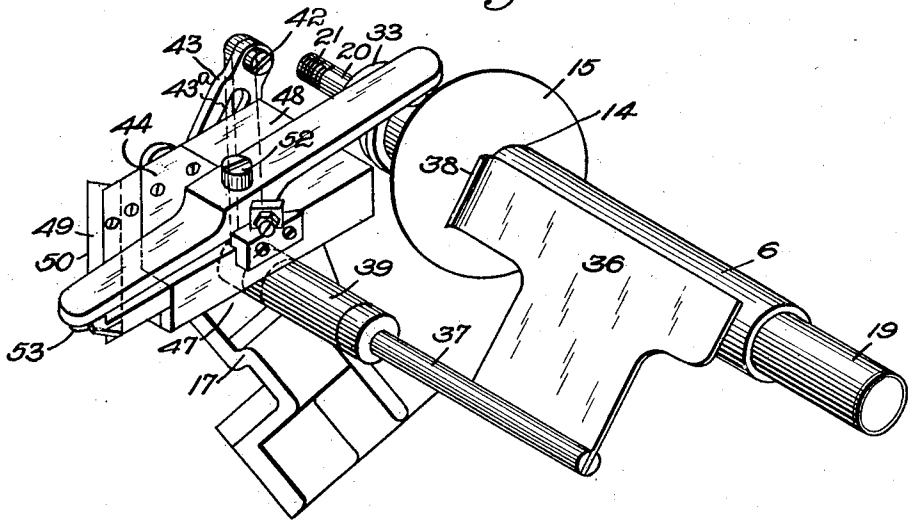
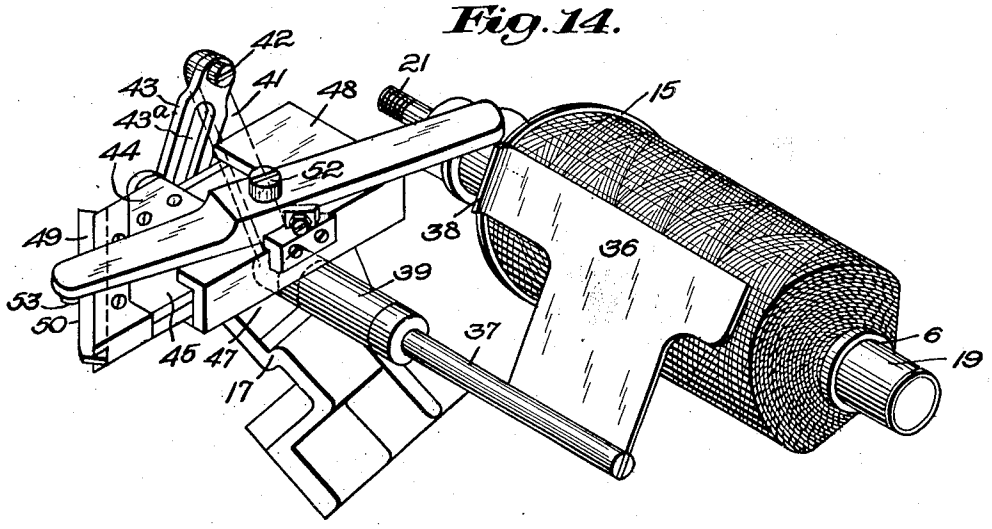


Fig. 14.



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Patented Apr. 3, 1934

1,953,641

UNITED STATES PATENT OFFICE

1,953,641

STRAND WINDING MACHINE

George P. Bosworth, Central Falls, R. I.

Application June 10, 1933, Serial No. 675,277

20 Claims. (Cl. 242—43)

This invention relates to machines for winding thread, strands, filaments or the like.

In order that the principle of the invention may be readily understood, I have disclosed two embodiments of means for practicing my invention and carrying out my method, in the accompanying drawings, wherein—

Fig. 1 is a front elevation of the mechanism of my invention which may be in the nature of an attachment operatively secured to a known type of winding machine, as, for example, a universal winding machine;

Fig. 2 is a plan view of the mechanism of my invention as constructed for winding a package upon a cylindrically shaped bobbin body, the parts being positioned for commencing the innermost layer;

Fig. 3 is a plan view of a part only of said mechanism and representing the position of the parts after the winding has proceeded for a multiplicity of layers;

Fig. 4 is a longitudinal section upon the irregular broken line 4—4 of Fig. 2;

Fig. 5 is a front elevation of the mechanism or attachment of my invention and representing also certain of the coacting old parts of the winding machine;

Fig. 6 is a section upon the irregular broken line 6—6 of Fig. 3 looking in the direction of the arrows in Fig. 3;

Fig. 7 is a transverse section through the mandrel and bobbin on the line 7—7 of Fig. 2;

Fig. 8 is a side elevation of the mechanism of my invention and representing the empty bobbin in dotted lines;

Fig. 9 is a plan view similar to Fig. 2 but representing that form of mechanism of my invention that is adapted to the winding of a conical package upon a conical or tapered bobbin;

Fig. 10 is a longitudinal section taken through the mandrel of tapering form for use with a tapering bobbin having a hollow base, indicated in dotted lines;

Fig. 11 is a view with parts broken away, similar to Fig. 10, but showing the construction of parts adapted to a tapered bobbin with a solid tapered base;

Fig. 12 represents in perspective view two forms of strip-like blade members to grip or engage the inner surface of the bobbin;

Fig. 13 is a perspective view somewhat diagrammatic and with parts omitted to make clear the movements of the parts, the bobbin being empty; and

Fig. 14 is a similar view representing the position of the parts when the bobbin is filled.

The purpose of my invention is to wind thread, strands, filaments, wire or other suitable material upon bobbins or containers in such a manner that the completed package will have a tapered outer end and a hollow inner or basal tapered end that is in substantial parallelism with said outer end and is wound against a tapering base of the bobbin.

The mechanism of my invention is of relatively simple construction and may be regarded as in the nature of an attachment which may be secured to existing types of machines, as, for example, the universal winding machine.

It is unnecessary to illustrate in detail the usual parts of the winding machine and for convenience I refer to the series of patents issued to Simon Wardwell, Jr. and others belonging to the Universal Winding Machine Co.

I have, in Fig. 1, indicated the end of a winding machine, as, for example, of the universal type, at 1. At 2 in said figure, I have represented the stud whereon is rockably mounted the arm 3 having a counterweight 4 to hold the thread guide 5 against the body of the bobbin indicated generally at 6. The arm 3 is provided at its upper end with an arc-shaped member 7 against which a friction rod 8 is adapted to bear during the winding operation. Said rod 8 is pivoted at 9 and has fast thereto an upwardly extending arm 10 in general parallelism with the arm 11 of the thread guide 5. In order to set the thread guide at the proper point for commencing the winding operation, the arm 10 and the arm 11 of the thread guide pivoted at 12 are grasped and moved toward each other, thereby releasing the friction rod 8 from the arc-shaped piece 7, whereupon the thread guide may be moved to the desired position for commencing the winding operation. The said thread guide 5 is of the usual construction excepting that, as shown at 13 in Fig. 8, the groove for the thread is positioned further to the left viewing Fig. 8 than heretofore, thus permitting the thread or strand T to be introduced to the exact circular line 14 which represents the line of union between the body portion 6 of the bobbin and the tapering base 15 of said bobbin. The structure of said bobbin is fully disclosed in my co-pending application Ser. No. 675,279, and need not be here further described. As shown in Fig. 14, the package or thread mass is composed of layers each having a relatively small number of so-called open coils as contrasted with a weft wind wherein there are a multiplicity of coils or turns each lying wholly in a plane cutting the axis of the package at right angles.

In said Fig. 1, the starting lever of the machine is indicated at 16. Therein is also indicated a bracket 17 shown as secured to the frame or body of the machine by screws 18. The said bracket may constitute the entire support for the mechanism of my invention, and is shown upon a larger scale in Fig. 5.

The mandrel of the machine is indicated at 19 in Figs. 2 and 8, where it is shown as of cylindri-

cal form and of reduced diameter at its inner end 20. It is threaded at 21 for securing it to a rotating shaft of the winding machine. The said mandrel may be and desirably is of usual construction excepting that it is provided with one or more longitudinally extending grooves 22 each preferably having a deepened portion 22' for the reception of a strip 23 constituting a blade-like part most clearly shown in Figs. 2 and 7. For the tapered bobbin, there is provided a long strip 24 for each groove 22 and the knife portion thereof, indicated as a head 25 with angularly arranged blades 26, 27, constitutes the means for engaging the strips 24 with the bobbin, whether it be the solid base 28 thereof, as indicated in Fig. 11, or the body portion 29 when a bobbin with a hollow base 30 is employed. The shorter strip 24' of Fig. 12 is employed when the edges or blades 26, 27 of the head 25 engage directly with the wall of the bobbin base 28, as indicated in Fig. 11.

In either case the strip-like part 23, 24 is provided with ribs 31 for engagement by a correspondingly shaped part 32 or 32' upon a sleeve or collar 33, shown clearly in section in Figs. 10 and 11 and in dotted lines in Figs. 2 and 7. The said sleeve or collar is provided with annular shoulders 34, 35, for engagement with a suitable part of the mechanism to be described, whereby during the winding operation the bobbin with its thread mass is moved incrementally lengthwise the mandrel toward the outer or free end thereof.

In the winding operation the innermost layer is commenced (or ended) at the line of union between the tapering base 28 or 30 and the body of the bobbin, whether that be cylindrical or tapering Said first layer extends to a point or circular line that is preferably close to the outer or tip end of the bobbin. The thread or other material is wound in the customary manner so far as the operation of the thread guide is concerned, there being a relative traverse between the thread guide 5 and the mandrel. Customarily the thread guide is traversed and the mandrel is rotated so that each layer consists of a number of so-called open coils extending about the bobbin body with a sharp or well defined bend or reverse turn at the completion of each layer of the package. Each successive layer is positioned at the basal end of the cone incrementally lower than the just preceding layer, that is, incrementally nearer the actual bottom of the cone, and each layer at its opposite end terminates incrementally nearer the base than the just preceding layer. The result is the formation of a package which at its upper or outer end, or end opposite its base, is tapered downwardly and outwardly, and which as to its hollow base is similarly tapered in approximate parallelism with said outer end, against the base of the bobbin.

It is to be understood, as set forth more in detail hereinafter, that the shape of the outer or tip end of the package need not be a straight line taper as it may be curved either outwardly or inwardly, or may be formed with convolutions, but in any case the outer end is of a generally tapered form.

While any suitable means may be provided to cause the bobbin and its forming thread mass to move along the mandrel, I preferably provide a member that is acted upon and moved by the forming mass and which at the same time presses against said mass with substantial force or pressure so as to insure the formation of a tight, very solid package.

Such member I term a former or presser, and one form thereof is indicated at 36 in Figs. 2, 13 and 14, where the same is shown as set into or secured to a rod 37 extending in parallelism with the mandrel 19. The said former or presser, which desirably is of the same length as an entire layer, but which may be shorter, bears against the body portion of the bobbin at the commencement of the winding operation, as shown in Fig. 1, and the train of mechanism between the said presser or former and the sleeve or collar 33 on the mandrel is such that the said presser or former bears against the bobbin body and against the forming package. The result is that as the presser or former is forced outward by the forming mass the surface of the said mass is ironed constantly during the winding operation, so that the package or mass is of an unusually solid character. If desired and as shown at 38, the end of the presser or former 36 that is nearest the base of the bobbin is curved or inclined so as properly to co-act with the basal end of the forming mass. My invention is not limited to the form or construction of presser or former shown at 36, as other forms or shapes may be used to accomplish the same purpose. Therefore, I use the term "presser" or "former" in a generic sense, as a part having the double function of (1) ironing or forming the mass, and (2) moving the mass while being formed.

The rod 37, as most clearly shown in Fig. 8, is received in a bearing 39 upon the framing of the machine. Upon the opposite end of said rod 37 from the presser or former 36 is secured by set screw 40 (Fig. 5) a lever arm 41 that at its outer end is pivotally secured at 42 to a link 43. The said link 43 is itself secured to a slide cover 44, shown most clearly in section in Fig. 4 and represented also in plan in Figs. 13 and 14. While the link 43 may serve merely as a connecting means and be unslotted, preferably the said link is provided with a long slot 43*a* having a communicating right angled portion 43*b*. When winding the bobbins, the link 43 will be in position as shown in full lines. When it is desired to wind the cylindrical bobbin, the link 43 is moved to a position shown in dotted lines (see Fig. 6) and the presser can be moved to an inoperative position, so that the link 43 will not move the slide 44 or lever 51. This allows the collar 33 to remain in position as shown in Fig. 2, and thus a straight sided cone is wound. The said slide cover 44 is itself fast to the body part 45 of the slide, which body part is received in the grooved portion 46 of a bracket 47, most clearly shown in Fig. 4. A second part 48 of the cover overlies the body part 45 of the slide but is not movable therewith. When the parts are in their position at the commencement of the winding operation, the cover parts 44 and 48 are in contact as shown in Figs. 2 and 13, but as the winding progresses the cover part 44 of the slide 45 moves outwardly or to the left viewing Figs. 3 and 14. This movement is due to the slow turning movement of the rod 37, which movement is transmitted through the lever arm 41 and the link 43 to the part 44.

Either integral with or structurally distinct from but attached to said part 44 is a shape-determining part 49 which may have a straight edge 50 or an edge that is concaved or convexed or convoluted. Whatever is the said shape, the same shape is imparted to the forming mass, inasmuch as the shape of the edge 50 determines the exact extent to which the forming thread mass is moved axially of the mandrel 19.

In order to cause the edge 50 to move the form-

ing thread package, I have provided a lever 51 pivoted at 52 upon the stationary part 48 of the cover, as clearly indicated in Figs. 2 and 3. Said lever 51 at its outer end is provided with a roll 53 to engage the edge 50 and is governed thereby. Said lever 51 at its opposite end is provided with a roll 54 to engage the annular groove 55 in the sleeve or collar 33. In this or in any other suitable manner the bobbin with the forming thread mass is moved incrementally outward or toward the bottom of the sheet viewing Fig. 2, with the result that a package of the form described is wound.

If a thread package of a tapering or conical shape is to be wound, the former or presser is shaped as indicated at 36' in Fig. 9, so as to press against the inclined or tapering body portion 56 of the bobbin.

If the bobbin is of a tapering character, it is preferably of the structure shown in Fig. 10 or Fig. 11. If a tapering bobbin with a hollow base is employed, the blades 26, 27 of the head 25 extend through the openings 57, 57 of the conical sleeve 58 on the mandrel, whereas if a bobbin with a solid base 28 is employed, the shorter strip-like parts 24' are provided, the heads 25 thereof extend through the openings 59 in said sleeve 58. The sleeve 58 and collar are held together by screws 60.

In Fig. 7 is indicated the action of the strip-like parts in engaging by their knife edges the inner wall of the bobbin. The bobbin having been slid onto the mandrel is turned slightly in a contraclockwise direction, as indicated by the arrow in Fig. 7, so as to cause the effective engagement of the bobbin with the mandrel. At the completion of the winding, the package is given a slight turn in the opposite direction to release the bobbin from the mandrel.

In practicing my invention, the package is wound layer after layer in a very tight condition and the said package is moved axially so that each layer is commenced and ended incrementally nearer the bottom of the bobbin than the just preceding layer. It will be observed that the means for so moving the forming package are entirely independent and distinct from the thread guide which moves in its customary manner but has nothing to do with the parts which cause the forming package to take the described form.

Having thus described one illustrative embodiment of means for practicing my invention, it is to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a member adapted to bear constantly upon the forming mass, said member having throughout substantially the entire forming of the strand mass both an ironing or forming function upon the said mass and also the function of moving said mass while being formed, and means controlled by the outward movement of said member for moving the forming strand mass incrementally along the mandrel and thereby controlling the shape of the outer end of said mass

2. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, one or more members adapted to slide along the mandrel, and means independent of the strand guide for moving said member or members along the mandrel during the winding operation, said means pressing against the mass substantially throughout the winding, and thereby cooperating in the forming of said mass.

3. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a member or members adapted to slide along the mandrel, a presser or former adapted to bear upon the forming mass and operative connections between said member or members and said former or presser whereby said presser or former has throughout substantially the entire forming of the strand mass both the double function of ironing or forming the mass and of moving said member or members along the mandrel.

4. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel being of cylindrical form to receive a correspondingly shaped bobbin, a member to engage said cylindrical bobbin at the commencement of the winding operation, and operative connections from said member to the bobbin for moving the same incrementally along the mandrel during the winding operation, said member thereby constituting throughout substantially the entire forming of the strand mass both a presser or former to cooperate in forming the mass and a means to move the bobbin incrementally along the mandrel as the bobbin is wound.

5. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel being of cylindrical form to receive a correspondingly shaped bobbin, a member to engage said cylindrical bobbin at the commencement of the winding operation, a member or members adapted to slide along the mandrel and adapted to be engaged with the interior surface of the bobbin during the formation of the package, and operative connections between said member and said other member or members, said first mentioned member thereby acting throughout substantially the entire forming of the strand mass both to iron or form the winding mass or package and to move the same along the mandrel during the winding operation.

6. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel being of a tapering form, a presser or former shaped to engage with the tapering portion of a bobbin upon the tapering mandrel, thereby cooperating in ironing the forming strand mass, a member or members adapted to slide along said mandrel during the winding operation, and operative connections between said presser or former and said member or members, whereby said presser or former also cooperates in moving the mass axially during its

formation, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

7. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel being of a tapering form, a presser or former shaped to engage with the tapering portion of a bobbin upon the tapering mandrel, thereby cooperating in ironing the forming strand mass, and operative connections extending from said former or presser to the inner wall of the bobbin upon the mandrel so as to cause said bobbin and the forming mass to move incrementally along the mandrel during the winding operation, whereby said presser or former also cooperates in moving the mass axially during its formation, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

8. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a former or presser adapted to bear upon the forming mass, and thereby functioning to iron the said forming mass, a rocking rod supporting said former or presser, a slide member or members upon the mandrel to engage the interior of the bobbin and operative connections from said rocking rod to said member or members, thereby to move said mass axially during its formation, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

9. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a presser or former adapted to engage the forming mass to co-act in forming the same, a rocking rod supporting the former or presser, a slide moved in operation by the movement of said rocking rod, and connections from said slide to the interior wall of the bobbin, whereby said presser or former also co-acts to move the strand mass axially during its formation, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

10. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a former or presser to engage the forming mass thereby to co-act in ironing the same, and connections between said former and the interior of the bobbin to move the strand mass axially during formation, including a removable plate having an edge to determine the shape of the tip end of the package.

11. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a former or presser to engage the forming mass, thereby to co-act in ironing the same, and connections between said former and the interior of the bobbin to move the strand mass axially during formation, including a member having an edge to determine the shape of the tip end of the package, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

12. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, a former or presser to engage the forming mass and thereby cooperate in ironing or forming said mass, a sliding member moved by the outward movement of said presser or former, a member or members slidable axially of the mandrel, and adapted to engage the inner surface of the bobbin and a lever connection between the said members, whereby said presser or former also cooperates in moving the mass axially during its formation, both said functions of the presser or former continuing throughout substantially the entire strand-mass-forming operation.

13. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel adapted to receive a bobbin with a conical base, and means pressing upon the surface of the forming mass for ironing said mass and for moving said forming mass axially throughout the winding operation so that the successive layers terminate at incrementally spaced lines along said conical bobbin base.

14. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound, means relatively to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass, said mandrel having axial grooves receiving members with knife edges, a presser or former to engage the forming mass to iron the same substantially throughout the winding operation, and operative connections from said presser or former to said members with knife edges whereby said presser or former also acts to move the forming mass axially substantially throughout the winding operation.

15. A strand winding machine consisting of a revoluble mandrel having thereon a longitudinally slidable member adapted directly to engage the support for the strand mass; a strand guide to present the strand to be wound; means to traverse said guide back and forth along the mandrel in the winding of the successive layers into a so-called open coil strand mass; a presser or former adapted to bear constantly upon the forming mass, and thereby functioning substantially throughout the forming of the mass in ironing or forming the same, a shape-determining part 49 operatively connected to and moved by the presser or former in its outward movement during the winding operation, and operative connections between said part 49 and the said slidable member, whereby said presser or former also functions in moving said forming strand mass axially substantially throughout the forming of the mass.

16. A strand winding machine consisting of a revoluble mandrel having thereon a longitudinally slidable member adapted directly to engage the

support for the strand mass; a strand guide to present the strand to be wound; means to traverse said guide back and forth along the mandrel in the winding of the successive layers into a so-called open coil strand mass; a presser or former adapted to bear constantly upon the forming mass and thereby functioning in ironing the same throughout the mass formation; and operative connections between said presser and said slidable member whereby said presser or former functions also in moving said slidable member and the forming strand mass incrementally along the mandrel throughout the mass formation.

17. A strand winding machine consisting of a revoluble mandrel, a strand guide to present the strand to be wound; means to traverse said strand guide back and forth along the mandrel in the winding of the successive layers into a so-called open coil strand mass; a presser or former adapted to bear constantly upon the forming mass and thereby functioning in ironing or forming the same substantially throughout the forming of the mass; a shape determining part 49 operatively connected to said presser or former and adapted to be moved by the outward movement of said presser or former, and operative connections between said shape-determining part and the support for the strand mass so as to cause, through the movement of the presser or former, the incremental movement of the strand mass substantially throughout the forming of the strand mass.

18. A strand winding machine consisting of a revoluble mandrel; a strand guide to present the strand to be wound; means to traverse said strand guide along the mandrel in the winding of the successive layers into a so-called open coil strand mass; a presser or former adapted to engage the forming strand mass to co-act in ironing the same; a rocking rod 37 supporting the former or presser; a part 44 operatively connected to and moved by the rocking of the rod 37; a shape-determining part 49 carried by the part 44, and operative connections between the part 49 and the support for the strand mass, whereby said strand mass is moved incrementally along the mandrel during the winding operation and through the movement of the presser or former, both said functions continuing substantially throughout the formation of the strand mass.

19. A strand winding machine consisting of a revoluble mandrel longitudinally grooved for the reception of one or more strips to engage the interior of the strand mass bobbin; a strand guide to present a strand to be wound; means to traverse said strand mass along the mandrel in the winding of the successive layers into a so-called open coil strand mass; a presser or former adapted to bear constantly upon the forming strand mass to co-act in ironing the same; a rocking rod carrying said presser or former; and connections between said rocking rod and said strip or strips whereby through the movement of the presser or former the forming strand mass is moved incrementally along the mandrel as the presser or former moves outwardly, both said functions continuing throughout the formation of the strand mass.

20. A strand winding machine consisting of a revoluble mandrel supported against axial movement but adapted to receive a strip or strips to be moved longitudinally therealong and directly to engage the support for the strand package, a strand guide to present the strand to be wound; means to traverse said strand guide along the said non-axially movable mandrel in the winding of the successive layers into a so-called open coil strand mass; and means to control the shape of the outer end of the winding mass by moving said strip or strips incrementally along the mandrel, and thereby moving the strand mass along the mandrel substantially throughout the winding of the strand mass.

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