O. R. VAN VECHTEN.

BRAIDING MACHINE.

APPLICATION FILED JAN. 3, 1910.

988,678.

Patented Apr. 4, 1911.

3 SHEETS—SHEET 1.

Fig. 7

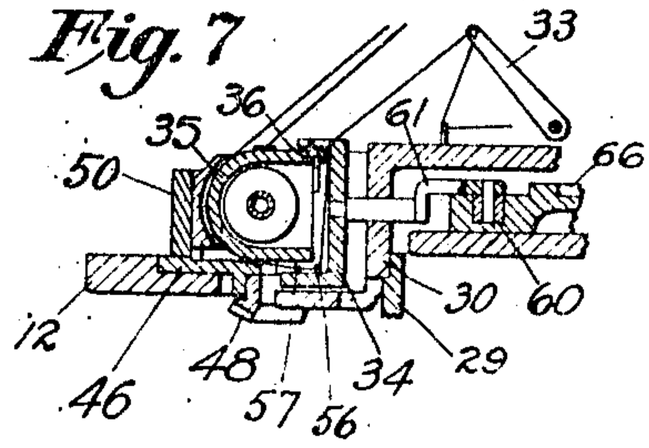

Fig. 8

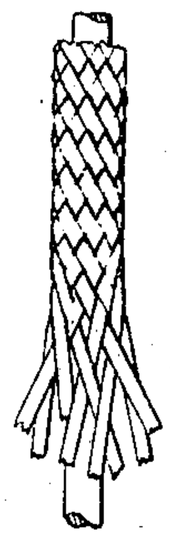

Fig. 1

Witnesses

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3 SHEETS—SHEET 2.

Fig. 2

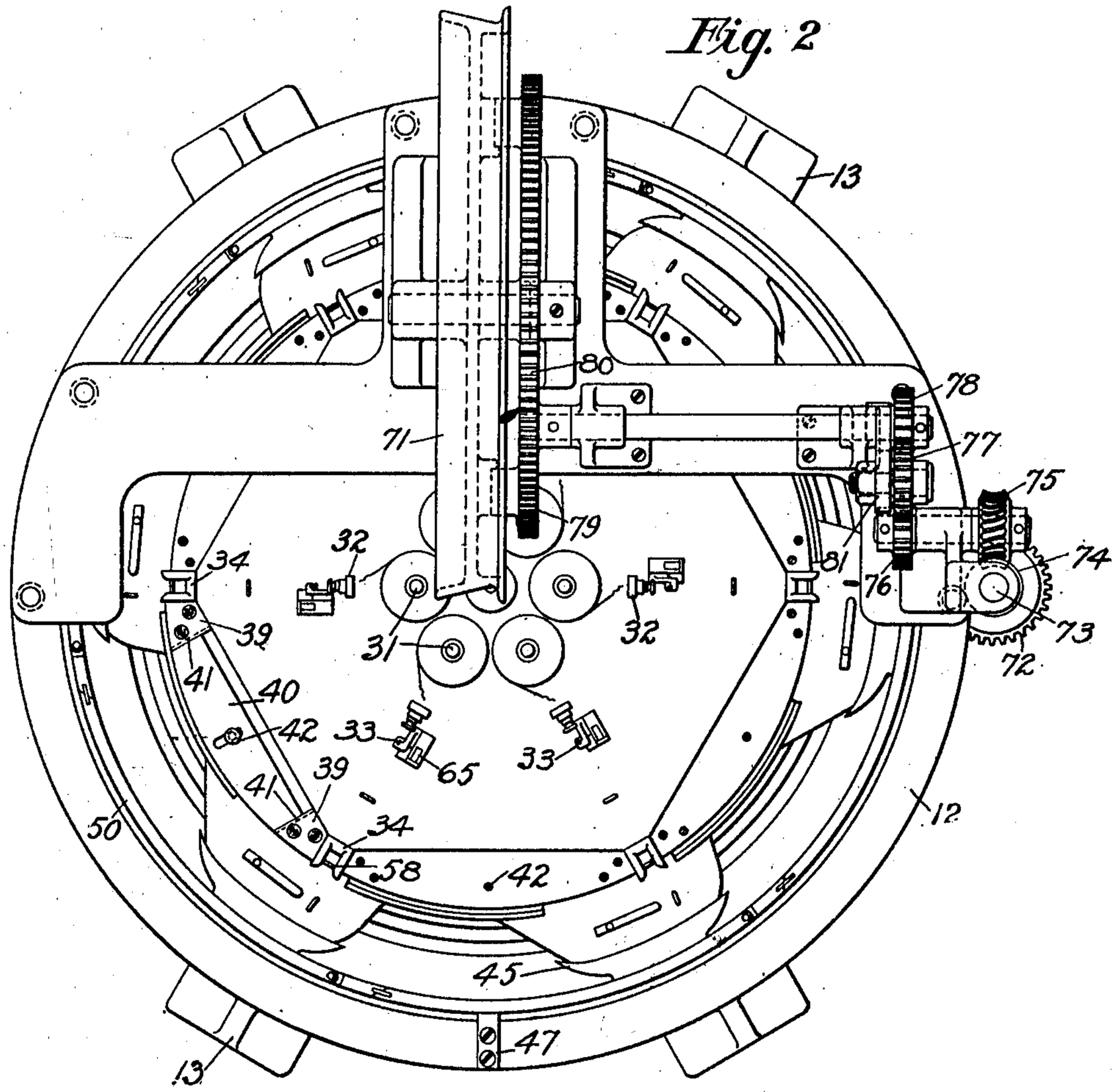


Fig. 5

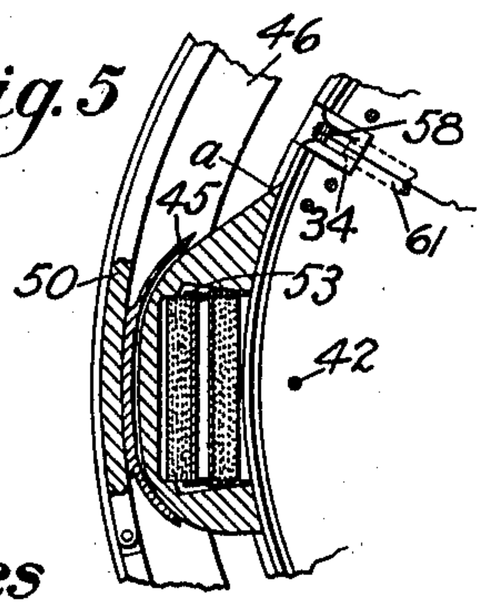
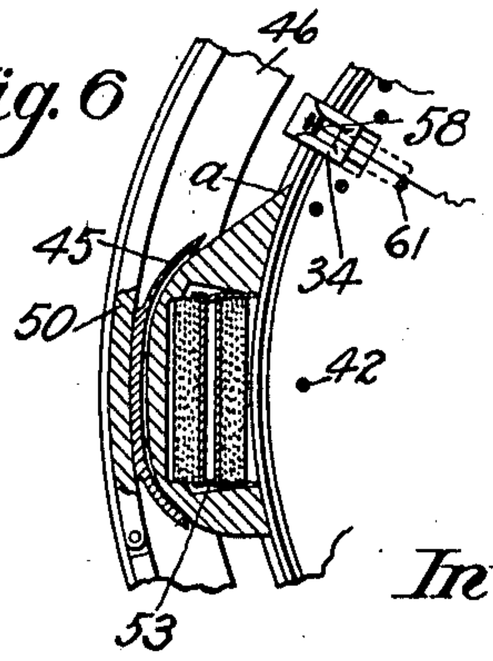


Fig. 6



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3 SHEETS—SHEET 3

Fig. 3

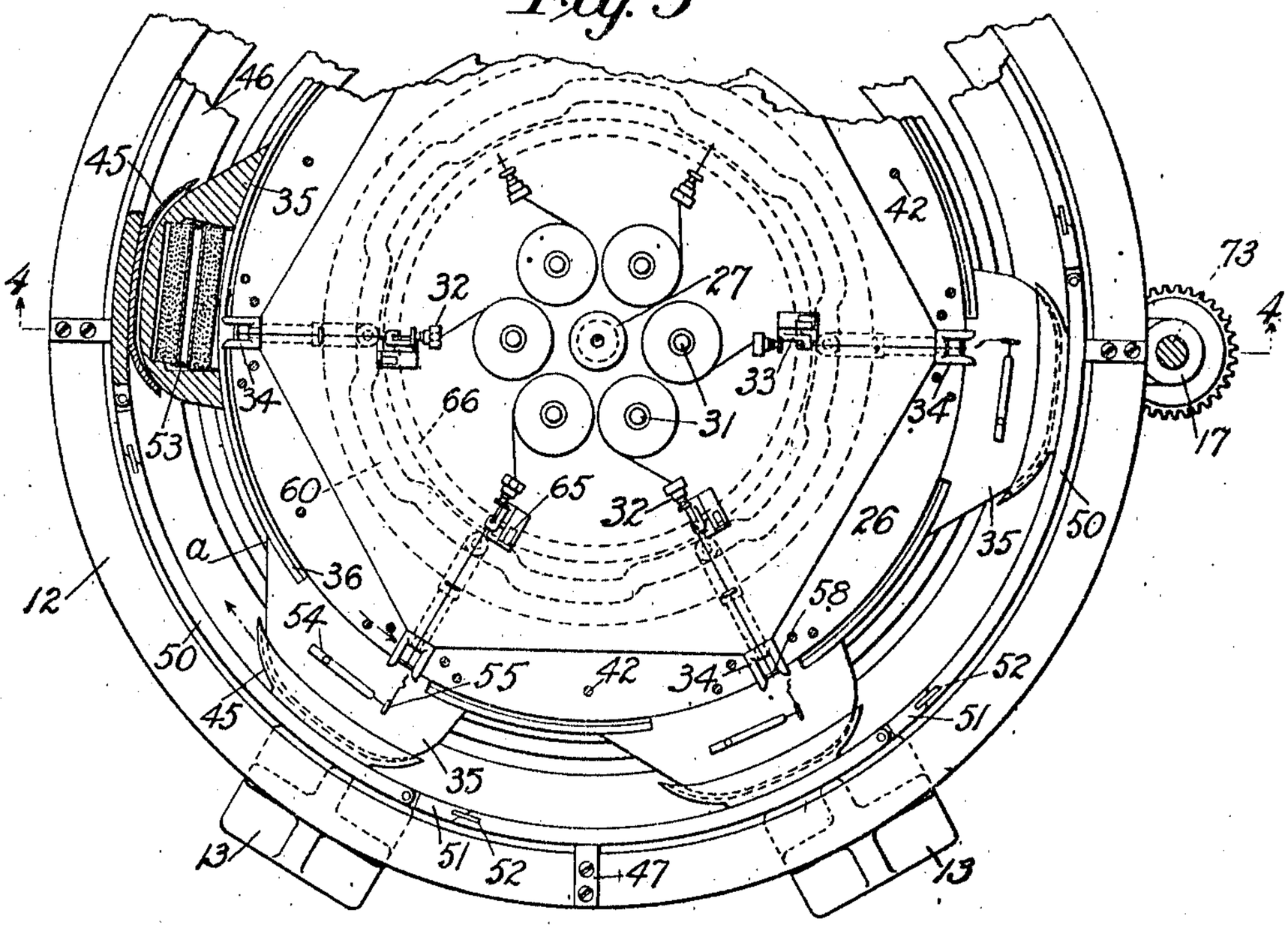
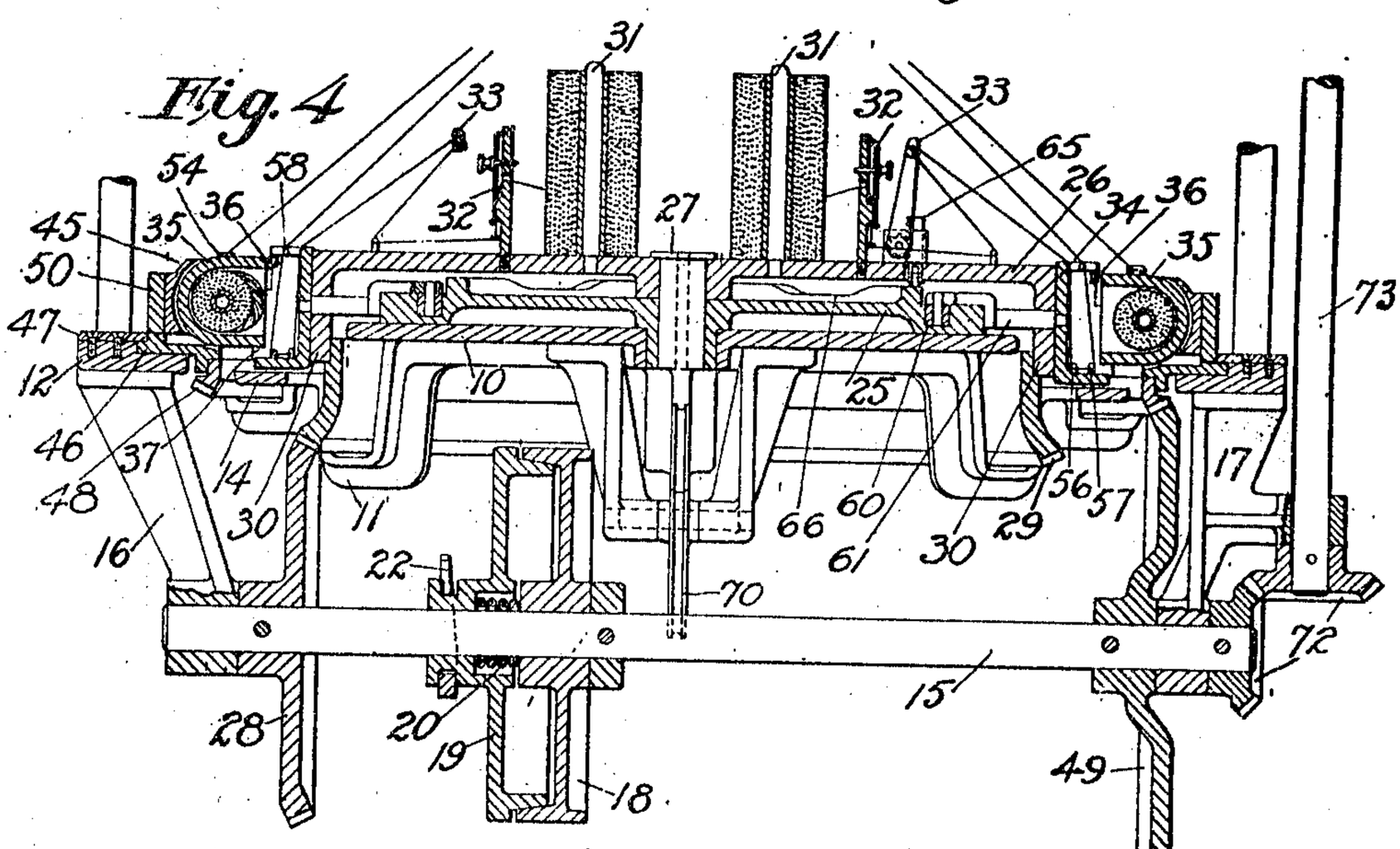


Fig. 4



Witnesses

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UNITED STATES PATENT OFFICE.

ORVILLE R. VAN VECHTEN, OF TOMPKINSVILLE, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO FREDERICK J. GRACE, OF NEW YORK, N. Y.

BRAIDING-MACHINE.

988,678. Specification of Letters Patent. Patented Apr. 4, 1911.

Application filed January 3, 1910. Serial No. 536,020.

To all whom it may concern:

Be it known that I, ORVILLE R. VAN VECHTEN, a citizen of the United States, residing at Tompkinsville, county of Richmond and State of New York, have invented certain new and useful Improvements in Braiding-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to braiding machines for braiding or weaving tubular fabric.

The invention has been made more especially with the idea of providing a machine for covering insulated electric conductors, but may be used for covering other articles, or for producing as the final product a hollow tubular fabric.

More particularly, the invention relates to braiding machines of that class in which one set of threads or strands is led from tubes carried by a rotating carrier, and the other set of threads or strands are led from tubes carried by oppositely moving shuttles.

The object of the invention is to provide a practical machine of this class which shall be simple in construction, certain in its operation, and which shall have a large production at a low operating speed, and which, because of its slow operating speed, the short movements of its reciprocating parts, and its simplicity of construction, shall be comparatively noiseless in operation and shall have great durability.

As a full understanding of the invention can best be given by a detailed description of a machine embodying the various features of the invention in a preferred form, such a description will now be given in connection with the accompanying drawings showing such a preferred form of machine, and in which—

Figure 1 is a side view of such a preferred form of machine in elevation; Fig. 2 is a plan view of the machine; Fig. 3 is a plan view partly broken away of the weaving or braiding mechanism proper, and with one of the shuttles and shuttle pushers shown in section; Fig. 4 is a section on line 4 of Fig. 3; Figs. 5 and 6 are detail plan views partly in section, showing one of the shuttles approaching one of the vibrating thread guides, and with the thread guide in different positions in the two views; Fig. 7 is a detail sectional view of one of the shuttles and thread guides taken on the same plane as Fig. 4, but with the thread guide in its outer position; Fig. 8 is a broken view of a portion of the product of the machine.

Referring to the drawings, the frame of the machine comprises a central table 10 from which radial frames 11 extend outward to an outer ring 12, the whole being supported by suitable legs or standards 13. The frames 11 are preferably also connected by an intermediate ring 14. The main driving shaft 15 is journaled in hangers 16 and 17 extending downward from the ring 12 at opposite sides of the machine. The shaft is driven through a driving pulley 18 which is mounted free to rotate on the shaft and to which the shaft is clutched when desired by means of a clutch disk 19 which is keyed to slide on the shaft and normally pressed away from the driving pulley by a spring 20, and which is provided with a beveled rim for engaging the beveled inner face of the rim of the driving pulley when the clutch disk is forced toward the driving pulley. For forcing the clutch disk toward the driving pulley, a hand lever 21 is provided which has a U-shaped or forked end formed to engage in an annular groove in the hub of the clutch pulley, the sides of said U-shaped end being tapered off, as shown at 22, so that when the U-shaped end of the lever is moved upward the clutch pulley will be forced against the driving pulley, and when the U-shaped end of the lever is moved downward the clutch pulley will be allowed to move away from the driving pulley under the pressure of the spring 20.

A stationary cam plate 25 is mounted on the table 10, and a circular plate or table 26 is mounted to rotate over the table 10 and cam plate 25, and is held in position by means of a short central hollow shaft 27. The table 26 is rotated by means of a bevel gear 28 on the driving shaft 15 which meshes with a bevel gear 29 carried by the downwardly extending rim or flange 30 of the table. The table 26 forms a revolving carrier for one set of the threads or strands to be woven, which set of threads will be called the carrier threads or table threads, and is provided with supports or posts 31 for the tubes or bobbins of the carrier threads.

Each carrier thread passes from its tube mounted on a post 31 through a tension device 32, thence past a stationary guide to a take-up arm 33, thence to a vibrating guide 34, and thence upward and inward to the point where the threads are braided together. The number of posts 31, tension devices, take-up arms, and vibrating guides will depend upon the number of threads to be braided. The machine shown is a twelve end or twelve thread machine in which the threads are divided into two sets of six ends each, and the machine therefore has six of the posts 31 and six sets of the devices for controlling the threads which pass from the tubes on the six posts.

The shuttles 35, of which there are six in the machine shown, are mounted to travel around and adjacent to the peripheral face of the rim 30 of the table or carrier 26, on a track on the rim of the table formed by an upper vertical flange or rib 36 and a lower flange or shoulder 37. The shuttles are formed with concave inner faces curved to correspond with the curve of the rim of the table 26. The lower edge of each shuttle rests on the shoulder 37, and each shuttle is formed or provided with an inwardly extending grooved portion which runs on the upper flange or rib 36. The shuttles are held down in place on the rim 30 by a projecting flange which is formed by the edges of stationary plates 39 and movable plates 40 mounted on the upper face of the table. The movable plates 40 are arranged to slide inward toward the center of the table from the position shown in the drawings to permit the shuttles to be removed, being guided by the undercut edges 41 of the stationary plates 39 and secured in position by set screws 42. The front end or nose *a* of each shuttle runs close to the face of the rim of the table 26, and the outer surface of each shuttle is convexly curved to form a smooth surface for the passage of the carrier threads as hereinafter described.

The shuttles are driven in the direction opposite to the rotation of the table or carrier 26 by means of pushers 45 carried by a ring 46 mounted on the outer ring 12 of the frame and held in position by means of removable clips or plates 47. The ring 46 carries a skeleton bevel gear 48 which meshes with a bevel gear 49 on the driving shaft 15 at the opposite side of the machine from the gear 28, so that the ring 46 will be driven in the direction opposite to that of the rotation of the table 26. The gears 28 and 49 will be timed, according to their distance from the axis of rotation of the table 26 and ring 46, so as to cause the table and ring to be driven with the same angular velocity. The pushers 45 are of hollowed out or concave form on the side toward the shuttle to correspond generally with the form of the outer side of the shuttle, and push the shuttles by engaging them near their rear ends while leaving a free passage for the entrance and passing of threads between the shuttle and the pusher until the thread reaches the point of engagement between the pusher and the shuttle, at which point the thread will be in engagement with smooth converging surfaces of the shuttle and the pusher, and the shuttle will be forced slightly forward relatively to the pusher to allow the thread to pass. The inwardly projecting forward end of the pusher serves to prevent the shuttle from running ahead of its proper position.

The pushers are carried by movable sections 50 of a vertical flange which extends upward from the ring 46, said movable sections being pivoted at the ends of stationary sections 51 of said flange and normally held in position by means of suitable fastening devices 52 at their free ends. When the fastening device 52 of any movable flange section 50 is released, the flange section 50 may be thrown outward to carry the pusher away from the shuttle and to give access to the face of the rim of the table or carrier 26. Each of the shuttles 35 carries a tube of thread or yarn, and, as shown, has a longitudinal chamber or recess for the tube of thread open on the side of the shuttle which runs against the rim of the carrier 26 and provided at each end with a supporting and positioning spring 53 arranged so that the tube of thread may be readily pushed into place and then rotatably supported by the springs 53, and that the empty tubes may be readily pulled out. The thread passes out from the interior of the shuttle through an opening in the top wall beneath a tension spring 54 and under a guide 55 from which it passes upward and inward to the braiding point.

The rim of the table or carrier 26 is formed with a number of vertical peripheral recesses corresponding to the number of tube pins or posts 31, and in these recesses are mounted the vibrating thread guides 34. Such guides 34 are formed with a vertical back plate and with top and bottom flanges spaced a distance apart greater than the vertical thickness of the shuttle and which extend below the line of travel of the bottom of the shuttles and above the line of travel of the top of the shuttles respectively, and the upper of which flanges is forked or cut away to permit the passage of the thread. The thread passing through each of such guides enters from the top, passes downward to a guide pin or staple 56, thence outward under a guide pin or staple 57, and thence upward past a guide pin 58 from which it passes upward and inward to the point of braiding. When the guides 34 are in their inner or retracted position, as shown in Figs.

2 to 5, the outer run of the thread will be inside of the path of movement of the shuttle noses, but when the guides are in their outward position, as shown in Figs. 6 and 7, the outer run of the threads will be outside of the path of movement of the shuttle noses, so that as a shuttle and an outwardly projected guide approach and pass each other, the nose of the shuttle will pass inside of the outer run of the thread carried by such guide and the thread will be drawn around the curved outer surface of the shuttle as shown in Fig. 7. It will be noted that this outer run of the carrier thread between the guide pins 56 and 57 is a free run; that is, the thread is not inclosed, but is free or open so that it may be engaged by and drawn out in a loop around the shuttles. The guides 34 are given their reciprocating outward and inward movements by means of a cam groove 60 in the upper face of the stationary cam plate 25, each guide being provided with an inwardly extending stem 61 which carries a cam roll running in the cam groove 60. The movement of the guides 34 need be only the very short movement required to move the outer run of the carrier thread back and forth across the path of movement of the noses or points of the shuttles, and the term "short" as applied to the movement of these guides in the claims is to be understood as meaning a movement sufficient for shifting the free outer run of the carrier thread across the path of movement of the noses of the shuttles, as distinguished from such longer movement as would be required to move the carrier thread clear across the path of movement of the body of the shuttle.

The take-ups 33 operate to pay out the carrier threads as they pass outside the shuttles and to take up the slack in the threads after they have passed around outside of the shuttles. These take-ups are formed by pivoted arms which are given a positive take-up movement by means of vertically sliding racks 65 which engage pinions fast to the arms and which racks are operated by means of a vertical cam 66 on the cam plate 25, the racks being shown as provided with cam rolls running on the face of such cam. The cam 66 is formed and timed to correspond with the cam 60 and with the travel of the shuttles, so that after the guides 34 have been projected to their outer positions and when the front end of the shuttles are passing the guides, the take-up arms will be moved forward and downward to give the necessary slack to permit the carrier threads to pass around the shuttles, and as the shuttles pass beyond the guides the take-up arms will be positively raised to take up the slack. In the machine shown, which weaves the threads in a simple over and under or basket stitch, cam 60 is formed to project and retract the reciprocating guides 34 in unison and in time with the meetings of the guides and the shuttles so that the shuttles will pass alternately all outside and then all inside of the carrier threads, each shuttle passing alternately inside and outside of successively met carrier threads.

The tension devices 32 may be of any suitable form. An adjustable tension device, such as shown, is preferred.

The wire, cable or other article or form about which the threads are to be braided is fed upward through the hollow shaft 27 to and past the braiding point. The machine shown is intended for braiding a covering on an electric conductor or cable, and is provided with means for guiding and feeding the conductor or cable upward through the machine comprising a lower guide wheel 70 carried by brackets below the plate 10 and an upper feeding and guiding wheel 71 which is driven from the driving shaft 15 through miter gears 72, vertical shaft 73, worm 74, worm gear 75, gears 76, 77 and 78, and gear 79, meshing with a gear 80 on the shaft of the guide and feeding wheel 71. Such gearing is timed to cause the conductor or cable to move upward at the desired speed relatively to the speed of the weaving mechanism, and according to the desired character of the weave. The gears 76 and 78 are preferably change gears to permit of variation in the speed of movement of the cable or conductor, and to provide for adjustment of the gear 77 for gears 76 and 78 of different sizes, the gear 77 is carried by an adjustable arm 81 mounted to swing about the axis of the gear 78 and held in its adjusted position by means of a bolt and nut cooperating with a slotted downwardly extending branch 82 of the arm 81, and the shaft of the gear 77 is mounted to be adjustable in a longitudinal slot in the arm 81.

In the operation of the machine, the carrier threads being threaded from the tubes on the pins or posts 31 through the respective tension devices, take-up arms and reciprocating guides, and thence upward to the braiding point, and the shuttle threads passing from the guides 55 on the shuttles upward to the braiding point, the carrier or table 26 is rotated in the direction of the arrow in Fig. 3, and the shuttles are driven in the opposite direction to make successive revolutions in time with the rotations of the carrier 26. The guides 34 through the operation of the stationary cam 60 are reciprocated in unison and in time with the movement of the shuttles so that as the shuttles pass the guides, the outer run of the carrier thread in each guide is presented alternately inside and outside of the path of the noses of successive shuttles, and each

shuttle as it meets successive guides passes alternately outside of and inside of the outer run of the carrier threads carried by such guides. The shuttle threads and the carrier threads will thus be braided or woven together to form a tubular fabric with a simple over and under or basket stitch, as is indicated by Fig. 8.

If it is desired to have the machine operate as a circular loom, that is to cause the shuttle threads to interweave with threads from tubes or bobbins on non-rotating supports, it is only necessary to have the table 26 remain stationary and cause the cam disk 25 to rotate in either direction at half the angular velocity of the shuttles. With the machine operating in this way, one set of threads in the product will extend longitudinally of the fabric and the other set of threads will run spirally around the fabric.

It will be understood that instead of having the threads or strands of yarn or other material for use in the machine wound on circular tubes, as shown, it might be thread wound on tapering tubes or cops, or on bobbins, or tubes having end flanges, and that the word "tube" as used herein in the claims is intended to include all forms of tubes or thread holders which might be used in the machine.

It is to be understood also that the invention is not to be limited to the exact construction, arrangement and combinations of parts as shown in the drawings, and to which the foregoing description has been mainly confined; but that it includes modifications and changes thereof within the claims.

What is claimed is:

1. In a braiding machine, the combination of a rotating tube carrier having a shuttle track and tube supports inside the shuttle track, shuttles mounted on the shuttle track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and vibrating guides mounted on the carrier inside the shuttle track and each having thread guiding parts moving in planes above and below the path of movement of the shuttle noses, whereby a free run of one of the carrier threads is guided and moved radially across the path of movement of the shuttle noses, the shuttles being formed with smooth bodies to force the carrier threads outward about themselves as they pass the vibrating thread guides.

2. In a braiding machine, the combination of a rotating tube carrier, shuttles, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and short-movement vibrating guides for the carrier threads mounted on the carrier inside the path of movement of the shuttles and formed each to move a free run of a carrier thread outwardly and inwardly across the path of movement of the noses of the shuttles.

3. In a braiding machine, the combination of a tube carrier mounted to rotate about a vertical axis, shuttles, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and vibrating guides for the carrier threads mounted on the carrier inside the path of movement of the shuttles and formed each to move a free substantially vertical run of a carrier thread substantially radially of the carrier across the path of movement of the noses of the shuttles.

4. In a braiding machine, the combination of a tube carrier mounted to rotate about a vertical axis, shuttles, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and short-movement vibrating guides for the carrier threads formed each to move a free run of a carrier thread substantially radially of the carrier across the path of movement of the noses of the shuttles.

5. In a braiding machine, the combination of a rotating tube carrier having a shuttle track, shuttles on said track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, tube supports and tension devices and take-ups mounted on the carrier inside the shuttle track, and vibrating guides mounted on the carrier inside the shuttle track formed to move free runs of the carrier threads outwardly and inwardly across the path of movement of the noses of the shuttles.

6. In a braiding machine, the combination of a rotating tube carrier having a shuttle track and tube supports inside the shuttle track, shuttles mounted to run on the shuttle track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and vibrating guides for the carrier threads mounted inside the shuttle track in recesses in the carrier extending across the shuttle track, said guides being formed each to move a free run of a carrier thread outwardly and inwardly across the path of movement of the noses of the shuttles.

7. In a braiding machine, the combination of a circular rotating tube carrier having a shuttle track on its peripheral face and having radial recesses extending inward from its peripheral face and through the shuttle track, shuttles mounted to run on the shuttle track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, and vibrating guides for the carrier

threads mounted in said recesses and formed each to move a free substantially vertical run of a carrier thread radially across the path of movement of the noses of the shuttles.

8. In a braiding machine, the combination of a rotating tube carrier, shuttles, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the carrier, vibrating guides for the carrier threads formed each to move a free run of a carrier thread across the path of movement of the noses of the shuttles, the shuttles being formed with smooth bodies to force the carrier threads outward about themselves as they pass the vibrating thread guides, and positively operated take-ups for the carrier threads.

9. In a braiding machine, the combination of a circular rotating table mounted to rotate about a vertical axis, tube supports mounted on the upper side of the table, a shuttle track on the rim of the table, shuttles on said track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the table, and short-movement vibrating guides mounted to move in recesses in the outer portion of the table and formed each to move a free run of a carrier thread outwardly and inwardly across the path of movement of the noses of the shuttles.

10. In a braiding machine, the combination of a circular rotating table mounted to rotate about a vertical axis and having a shuttle track, tube supports and take-ups on top of the table inside the shuttle track, shuttles mounted to run on the track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the table, vibrating guides formed to move free and substantially vertical runs of the table threads radially across the path of movement of the noses of the shuttles, and a cam beneath the table for operating said guides.

11. In a braiding machine, the combination of a rotating table mounted to rotate about a vertical axis and having a shuttle track, tube supports and take-ups on top of the table inside the shuttle track, shuttles mounted to run on the shuttle track, shuttle driving means for driving the shuttles in the direction opposite to the direction of rotation of the table, vibrating guides carried by the table inside the shuttle track and formed to move free runs of the table threads across the path of the movement of the noses of the shuttles, and a cam beneath the table for controlling the movement of the take-ups.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

ORVILLE R. VAN VECHTEN.

Witnesses:

EDWARD LEMBERGER,

REGINALD T. SCHENCK