April 8, 1941. M. JOHNSON ET AL 2,237,560

WIRE WINDING MACHINE

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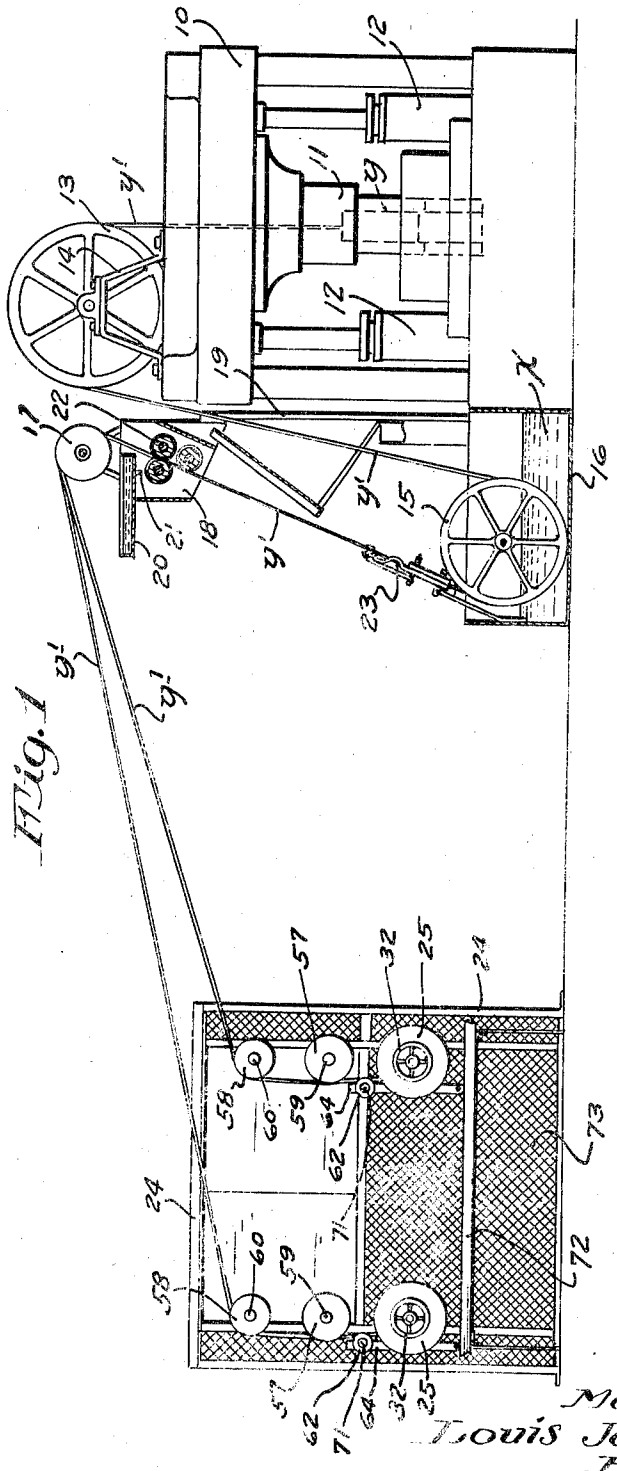

Fig. 1

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Fig. 2

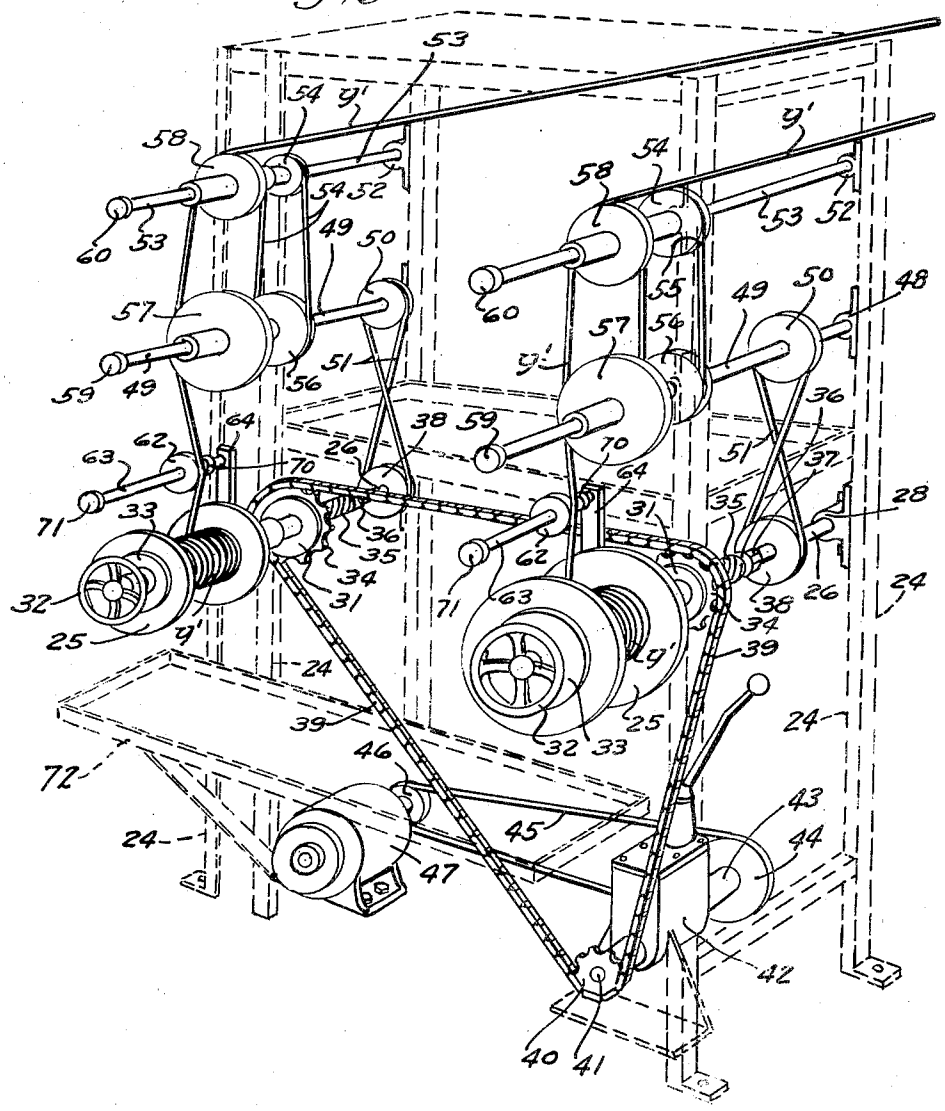

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Fig. 3

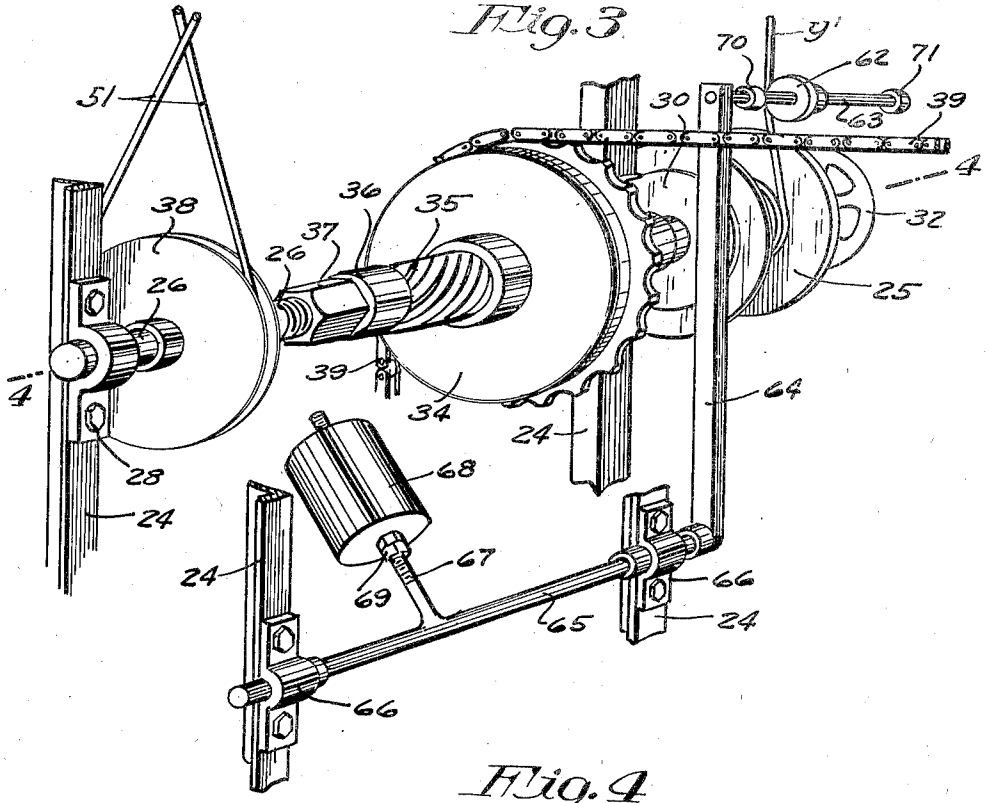
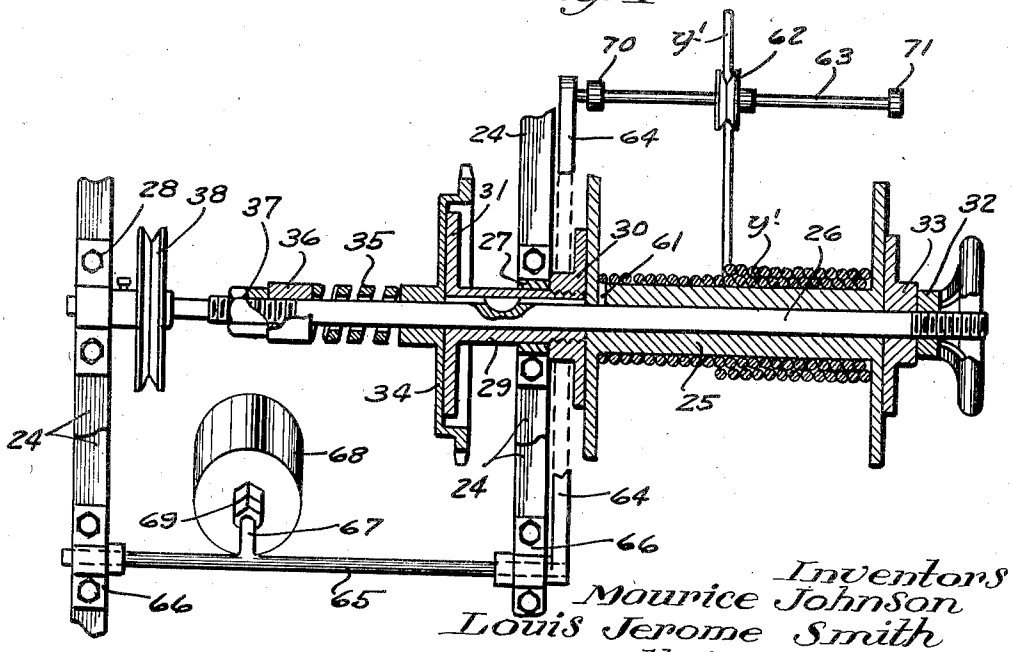


Fig. 4



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UNITED STATES PATENT OFFICE

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WIRE WINDING MACHINE

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5 Claims. (Cl. 242—25)

Our invention relates to machines for winding wire or like strands on spools or similar holders, and, generally stated, the invention consists of the novel devices, combinations of devices and arrangement of parts hereinafter described and defined in the claims.

The winding machine has been especially designed for the winding of wire produced by extrusion mills or presses. In the instant case, the wire is formed of lead or lead alloys and is of the character adapted subsequently to be used in the making of bullets or shot for cartridges. The lead or similar metal in the form of billets or slugs is placed in the cylinder of the extrusion mill and, under high hydraulic pressure, is ejected from the mill in the form of wire of the proper diameter for making the particular bullets or shot.

The improved winding machine is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a side elevation showing the improved winding machine in connection with the extrusion mill from which the wire is extruded and drawn to and wound on the spool or spools by the winding machine;

Fig. 2 is a perspective showing the winding machine with certain parts such as enclosing screens removed;

Fig. 3 is a perspective of one of the receiving spools and immediately co-operating parts of the winding mechanism; and

Fig. 4 is a vertical section taken approximately on the line 4—4 of Fig. 3, some parts being shown in full.

Of the parts of the extrusion mill diagrammatically indicated in Fig. 1, it is only desirable for the purposes of this case to particularly note the frame 10, the cylinder and piston extrusion press 11, and the hydraulic cylinder and piston rams 12. The billet indicated by dotted lines at *y* is, under hydraulic pressure, ejected in the form of wire from the press 11 and in the particular arrangement illustrated, passes over a guide wheel 13 journaled on a bracket 14 mounted on the top of the frame 10. In the press shown, the wire is ejected in the form of two strands *y'*. These wires are run under a guide wheel 15 arranged to run, in part, in cooling water *x* contained in a tank 16. From the wheel 15, the wires *y'* are passed upward over an elevated guide wheel 17 located on a bracket 18 supported by a mast 19 adjacent to the frame 10. The bracket 18 also supports an oil pan 20 that has a drip nipple 21 that slowly drops oil onto rollers 22 journaled to the bracket 18 and between which the wires travel frictionally. In passing from the wheel 15 to the wheel 17, the wires run through a wiper 23 that wipes off the water from the wires. By the rollers 22, a small amount of oil will be applied to the wires. So far as the present invention is concerned, however, the wires may be produced in various different ways and the number of wires may vary from one to any desirable number. The present winding machine, however, is shown as designed to simultaneously wind on spools two of the wire strands.

The mechanism of the winding machine is best shown in Figs. 2, 3 and 4, and all of the parts thereof are shown as mounted directly or indirectly on a rectangular skeleton framework 24. The spools, of which in the present instance there are two, are indicated by the numeral 25, and these spools are telescoped onto spindles or shafts 26 that are journaled in suitable bearings 27 and 28 on the framework 24. The spindle 26 is extended through and keyed to a sleeve 29 that is directly journaled in and extended through the bearing 27. At one end, the sleeve 29 is provided with a rigidly secured disc-like spool clamping head 30, and at its other end is shown as provided with a disc-like friction head 31. The projected ends of the spindles 26 are threaded and provided with nut-acting clamping wheels 32 which, when tightened, press clamping heads 33 directly against the spools and cause the said spools to rotate with the respective spindles.

The friction head 31 is yieldingly pressed against the disc-like face of the sprocket or driving wheel 34, the hub of which is subject to a coiled spring 35 that reacts against a sliding collar 36 that is subject to an adjusting nut 37 that has threaded engagement with the spindle, as best shown in Fig. 4. Also, the spindles 26 carry driving wheels 38 in the form of grooved sheaves.

A driving belt in the form of a sprocket chain 39 runs over the two sprocket wheels 34 and over a driving sprocket 40 that is carried by the variably driven shaft 41 of a variable speed transmission mechanism, the casing 42 of which is shown as rigidly secured to the framework 24. The constantly driven shaft 43 of this transmission mechanism carries a driving wheel in the form of a pulley 44. The variable speed transmission mechanism within the casing 42 may be of any well-known or approved construction.

The pulley 44 and shaft 43 of the transmission mechanism is shown as driven by a belt 45 that runs over the driving pulley 46 of a small electric motor 47 suitably mounted on the framework 24. Mounted in suitable bearings 48 on the frame 24 and located above and extended parallel to each shaft 26 is a rotary shaft 49 that carries a driving wheel or sheave 50. In this duplicate winding machine, crossed belts 51 run over the corresponding underlying sheaves 38 and sheaves 50.

Mounted in suitable bearings 52 on the frame 24 and extended above and parallel to each shaft 49 is a similar rotary shaft 53 that carries a wheel or sheave 54. A belt 55 runs over the sheave 54 and over a sheave 56 carried by the underlying shaft 49. Mounted on each shaft 49 with freedom to rotate and slide axially thereon, is a wire-guiding sheave or wheel 57; and mounted on the overlying shaft 53 with freedom to rotate and slide axially thereon, is a similar wire-guiding sheave 58. The shafts 49, at their projecting ends, are shown as provided with stop collars or heads 59 that prevent the sheave 57 from sliding off from said shafts; and at their projecting ends, shafts 53 are shown as provided with similar stop collars or heads 60 that prevent the sheaves 58 from sliding off said shafts.

The wires *y'* delivered from the press or wire-forming machine or other source, are caused to run in the grooves of the sheaves 57 and 58 and onto the corresponding spools 25. As a simple means for attaching the wires to the spools, the latter are shown, see Fig. 4, as provided with holes or seats 61 into which the ends of the wires can be inserted to start the initial winding actions on the spools.

The wires on their way from the shafts 57 to the spools are caused to run against and to be pressed by small guide sheaves or wheels 62, mounted on non-rotary shafts or spindles 63 that are rigidly secured to and project from presser arms 64 secured to one end of rock shafts 65 mounted in suitable bearings 66 on the frame 24. Rock shafts 65 have projecting arms 67 on which quite heavy weights 68 are mounted for axial adjustments under the action of nuts 69 that have threaded engagement with said arms 67. The spindles 63 are provided with stop collars 70 and 71 that limit the sliding movement of the sheave or wheel 62. The numeral 72 indicates a drip pan secured to the frame 24 and located under the winding spools to catch any oil or the like that may drop from the wires winding on the spools. The wires in the present instance will be of soft metal and very easily bent, and of such nature that when wound on the spools, there will be no tendency of the wires to unwind. In fact, the wires loose from the press described will be very ductile, very easily bent and will maintain any form in which they are bent unless force is applied thereto.

In Fig. 1, the front of the frame 24 is shown as partly enclosed by wire screens 73, which elements, however, constitute no part of the present invention and are not shown in the other views.

Operation

The operation of the winding machine described will be substantially as follows: Under driving action from the motor 47 and transmission device described, the spools will be rotated in a counter-clockwise direction in respect to Figs. 1 and 2. The winding speed will be sufficient to keep the wires delivered from the press drawn taut or free from slack during the winding action on the spools. If the rotary movement transmitted to the spools should be somewhat in excess of that required to draw the wires taut, there will be a slippage between the clutch-forming elements 31 and 34 which will insure the proper winding action without applying such tension to the wires as would tend to break the same. The frictional action of the clutch-acting elements will, of course, be varied and properly set by adjustments of the nuts 37.

It is now important to note that the weights 68 on shafts 65 exert force on the arm 64 which causes the pulleys of the wheels 62 to press the wires toward the right, in respect to Fig. 2, and cause the wires to be tightly wound on the spools, and to maintain a running contact with the sheaves 57 and 58. Of course, as the coils on the spools increase in diameter, the weighted arms will yield and permit the sheaves 62 to recede, but all the time causing the same to press the wires in the direction stated. As the wires are spirally wound on the spools, they will move axially of the spool and cause the sheaves 62, 57 and 58 to shift laterally on their respective shafts.

Under the winding movements of the cables on the spools, the wires will be pressed against the shafts 57 and 58, causing the said sheaves then to rotate in a counter-clockwise direction, which is the same direction as the winding movement of the spools. Here attention is called to the fact that when the machine is in operation and the spools are rotated in a counter-clockwise direction, the shafts 49 and 53 will be rotated in a reverse direction, to wit: in a clockwise direction. Hence, if there was no frictional contact between the wires and the sheaves 57 and 58, they would, by frictional contact with the shafts 49 and 53, be rotated in the same direction as their shafts 49 and 53, to wit: in a clockwise direction. Even when the wires are drawn against the sheaves 57 and 58 and caused to rotate in a counter-clockwise direction, as stated, their shafts 49 and 53 will be rotated in a clockwise direction and have a frictional tendency to rotate with their shafts, which, however, will be entirely overcome by the frictional contact between the wires and the said sheaves.

In practice, we have tried mounting the said sheaves 57 and 58 or their equivalents, on non-rotary shafts and also mounting the same on shafts driven in a clockwise direction or in the same direction as the movement imparted by contact between the wires and the said sheaves; but we have found that the above described manner of mounting the said sheaves so that they will be rotated in the opposite direction to the rotation of their shafts, produces a more satisfactory operation and seems to free the said sheaves for lateral travel on their shafts to follow the natural winding of the wires on the spools.

Of course, the above described directions of operation might be reversed from those stated, in which event there would still be the same tendency of the shafts to rotate the sheaves against the direction of rotation produced by contact between the wires and the sheaves.

As already indicated, the machine may involve one or more spools and operating mechanisms. The machine has been especially designed for

winding wire of the character stated, but may be used to wind various other kinds of strands, wires or cables. From the foregoing, it will further be evident that the machine is capable of various modifications within the scope of the invention herein disclosed and claimed. The machine described has been put into actual commerical use and has been found highly efficient for the purposes had in view.

The term "spool" is herein used in a liberal sense to include any kind of a hub or similar member upon which the wire or cable can be wound. In practice, I have found that the lateral shifting of the cable on the spool is made more certain and accurate with a plurality of laterally shiftable rotary guide sheaves or wheels which divide or distribute the lateral shift produced by the spiral winding action.

What we claim is:

1. In a winding machine, a receiving spool, means for rotating said spool, and a wire-guiding wheel adjacent said spool mounted to rotate and to move laterally on an axis extended approximately parallel to the axis of said spool, a second wheel guiding shaft extended parallel to said first noted guide shaft and to the axis of the spool, a presser wheel mounted to rotate and slide laterally on said second guide shaft and to engage the wire at a point between said first noted guide wheel and said spool, and a support for said second guide shaft under yielding strain to press said guide wheel against said wire and to press said wire toward said spool the pressure wheel on said second guide shaft being free for lateral sliding movements independently of the support thereof and of the first noted guide wheel.

2. The structure defined in claim 1 in which the support for said second guide shaft is a pivoted weighted lever.

3. In a winding machine, a receiving spool, a guide shaft adjacent to said spool and extended approximately parallel to the axis of said spool, a grooved guide wheel mounted to frictionally rotate on said guide shaft and to freely slide laterally on said shaft to follow the winding action on the spool, means for rotating said spool in a direction to wind the wire thereon, and means for rotating said guide shaft in a direction reverse to the direction in which said guide wheel will be rotated by the frictional contact therewith and the wire that is being guided thereby to the spool, in combination with a laterally shiftable presser wheel yieldingly pressed against the wire between said guide wheel and spool, in a direction to press the wire onto the spool but lateraly shiftable to follow the winding of the wire on the spool.

4. In a winding machine, a framework, a receiving spool, a spool-supporting shaft on which said spool is detachably mounted, upper and lower shafts located above said spool in parallel relation thereto, grooved wire-guiding wheels on said upper and lower shafts slidably mounted thereon to follow the winding of the wire on the spool, a lever pivotally supported on said frame adjacent said spool and provided with a laterally projecting shaft, a presser wheel rotatably and slidably mounted on the shaft of said lever, and retractable means yieldingly operative on said lever to force said presser wheel against the wire in a direction to press the latter onto the spool.

5. The structure defined in claim 4 in further combination with driving mechanism operative to rotate the spool in a direction to wind the wire thereon and to rotate said upper and lower shafts in a direction tending to frictionally rotate the guide wheels thereof in a direction reverse to the direction in which said guide wheels are positively rotated by the frictional contact between the same and the wire delivered thereover to the spool.

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