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VARNISHING AND DRYING OVEN FOR WIRE AND THE LIKE

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Fig. 1

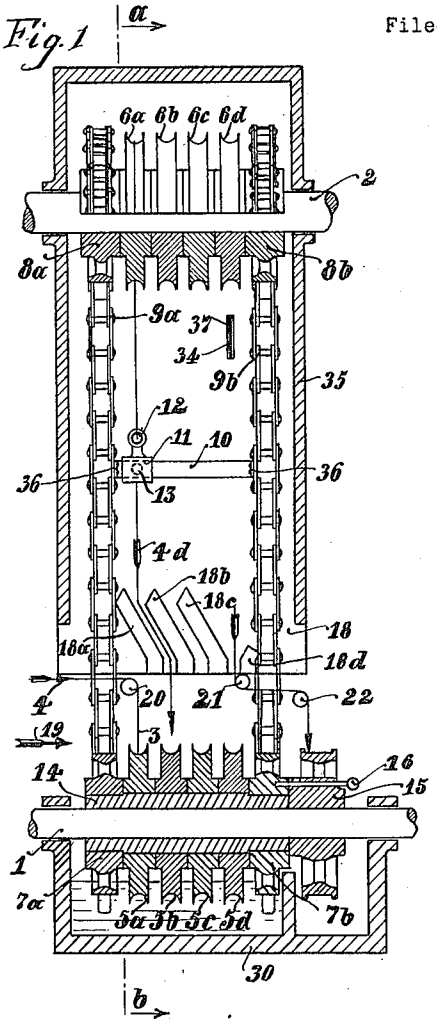
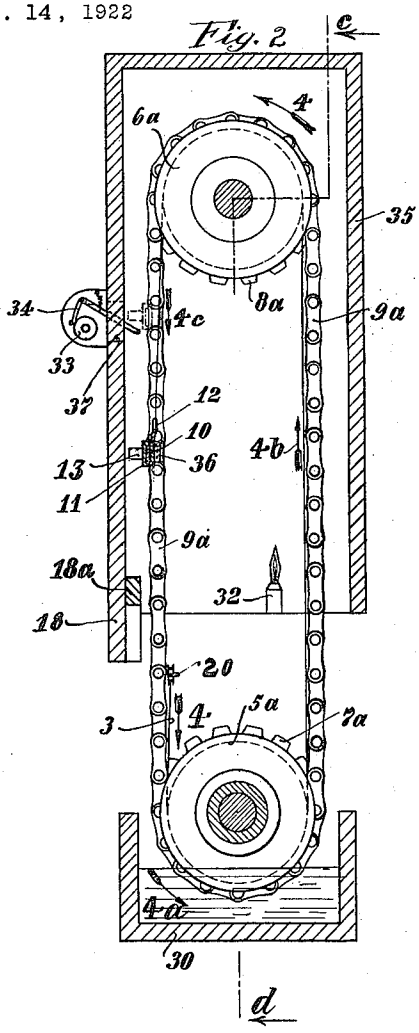


Fig. 2



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UNITED STATES PATENT OFFICE.

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VARNISHING AND DRYING OVEN FOR WIRE AND THE LIKE.

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To all whom it may concern:

Be it known that I, WALTER OSTHOFF, a citizen of Germany, residing at Barmen, Germany, have invented certain new and useful Improvements in Varnishing and Drying Ovens for Wire and the like (for which I have filed application in Germany August 8, 1921), of which the following is a specification.

My invention has reference to a varnishing and drying oven for wire and the like. It particularly refers to the coating of wires with a varnish, japan or enamel for insulating purposes, and it provides means for effecting the introduction of the thin wires to be coated, of copper wire for instance, by mechanical means and in such a manner that the wire to be varnished or japanned is caused to pass through the varnishing or japanning liquid and through the drying oven from the beginning of the working operation and during the introduction of the wire into the guide rollers with the same unalterable velocity which is employed in the regular course of working. These and other important advantages and objects of my invention will more fully appear as the specification proceeds.

The means heretofore employed for the curing and drying of the varnish coating and for applying said coating are generally constructed in such a manner that one guide roller system is mounted in the coating liquid itself, while another guide roller system is mounted at some vertical or horizontal distance from said liquid and usually about ten feet above the same. The copper thread or the like is introduced into the two guide roller systems in the devices as heretofore employed in such a manner that the roller system which is not housed in the liquid is moved by manually operated means within immediate vicinity of the roller system first mentioned. Then the copper thread is placed by hand over the cooperating pairs of rollers and on the delivery spool upon which the finished wire is wound up. Then the second roller system is slowly and cautiously returned by manually operated winches or the like into its working position in the drying oven so as to avoid, if possible, tearing of the very weak copper wire, the strength of which amounts to about 0.05 to 0.2 millimeters. After the rather tedious work has been done the delivery of the wire upon the receiving roller with the required operating speed which is necessary for the varnishing and drying of the wire, is started. In view of the fact that with a distance of about ten feet between the two roller systems and with ordinarily five rollers arranged side by side of each other there are about a hundred feet of wire between the drawing off spool and the winding up spool, and inasmuch as the enameling or varnishing process, that is to say the usual fivefold immersion of the copper wire into the varnishing liquor and the succeeding fivefold drying of the varnish or japan upon the copper wire are only terminated, after the piece of copper wire which enters the varnishing liquor with the normal working speed, has left the fifth roller of the second roller system and is being wound up on the winding up spool, it appears that the more than a hundred feet of copper wire required for every drawing-in stage are imperfectly varnished and deficiently insulated and have to go to waste. This causes a very heavy loss of copper wire which with one drawing-in operation of a thirty spindles machine amounts to about three thousand three hundred feet of copper wire. Inasmuch as the drawing-in of the wire, even if cautiously done by specially skilled workmen consumes much time, the operation of a thirty spindles machine with weak copper wire requires the attendance of at least three workmen, because breaking of threads frequently occurs also during the operation itself. Upon each breaking of the thread, however, the copper wire has to be drawn in in the manner hereinbefore referred to, thereby entailing a loss of an additional more than 100 feet of copper wire.

The present invention is intended to completely overcome all these difficulties by providing each pair of guide rollers with a mechanical thread guide. The copper thread is fastened to the thread guide in the drawing-in operation by tying or winding. Then the thread guide is connected by a suitable clutch to the driving means of the winding spool, and it is then moved through the varnishing liquor with the copper wire and with the normal working speed, while the thread guide inserts the thread into the groove of the first roller system. The wire or thread is then conducted through the drying oven and to the first roller of the stationary second roller system, and is placed

by the thread guide into the groove of this roller and so on, until the thread has passed the last roller of the stationary second roller system. Thence the thread guide is moved within the vicinity of the roller system first referred to, whereupon the thread is torn off and is fed to the winding-up spool by way of an auxiliary roller. This tearing off and fastening to the winding-up spool may easily be arranged in such a manner as not to interfere with the continuous feeding of the copper thread. The thread is therefore conducted through the varnishing liquor and through the drying oven from the moment of tying it to the thread guide until it is being fastened to the winding-up spool with the prescribed speed and as required by the operation of the reception spool in the normal operation of the machine.

By these means the important object is accomplished that the thread is properly treated from the beginning of its introduction into the varnishing liquor so that no waste can be caused by the introduction of the thread into the drying oven. The work of the attendant is limited to the tying of the thread to the eye of the thread guide and the connection with the driving means of the winding-up spool, which consumes but a few seconds. The thread guide may be connected to an alarm device adapted to emit an audible or other signal when the thread has been inserted into the last roller of the second roller system and is approaching the winding-up spool. In the intervening time the operator is free to attend to other spools. By means of the device according to this invention the additional advantage is obtained that the first roller system which is mounted in the varnishing liquor may be permanently retained therein, inasmuch as the wire is conducted through the varnishing liquor by means of the thread guide, thus avoiding soiling of the hands of the operator and keeping off impurities from the varnishing liquor.

In all previous devices of the kind referred to the first roller system had to be removed from the varnishing liquor and the winding up mechanism had to be thrown out of operation until the workman had manually inserted the thread into the two roller systems, and only after the second roller system had been returned to its operative position, the first roller system could be again operatively arranged in the varnishing liquor and could be connected to the driving means for the winding-up spool.

The thread guide is preferably made to share in the movement for such time only as is necessitated for the drawing-in of a wire. After this operation has sufficiently progressed, so as to allow of the tying of the thread to the winding-up spool, it is preferable to disengage the thread guide from the driving mechanism of the winding-up spool and to leave it standing in the immediate vicinity of the varnishing or japanning liquor, that is to say in a position within easy reach of the attendant.

It is, however, also possible to keep the thread guide in continuous circulation, but this procedure entails the difficulty that upon the breaking of a thread the attendant is compelled to wait until the thread guide has moved within his reaching distance.

The thread guide may be constructed in various ways. A very convenient form of construction is shown in the drawings accompanying this specification,

Figure 1 being a section on the line *c—d* of Figure 2.

Figure 2 is a section on the line *a—b* of Figure 1.

In the drawings 1 is the shaft of the first roller system which is mounted in the varnishing liquor tank 30, 2 is the shaft of the second roller system which may be mounted at the inside or the outside of the drying oven 35, a gas burner 32 being provided for heating said oven. The copper wire 3 to be coated should pass through the drying oven in the direction of the arrows. 5^a, 5^b, 5^c, 5^d, are guide rollers mounted upon the shaft 1, and 6^a, 6^b, 6^c, 6^d, are guide rollers on the shaft 2. The two sprocket wheels 7^a, 7^b, of the first roller system are mounted upon the shaft 1, and the two sprocket wheels 8^a, 8^b are mounted upon the shaft 2. The sprocket wheels 7^a, 7^b, and 8^a, 8^b are arranged respectively to the right and left of the guide rollers 5^a to 5^d, and 6^a to 6^d respectively. Upon the two sprocket wheels 7^a and 8^a a chain 9^a and upon the sprocket wheels 7^b and 8^b a chain 9^b is placed. The two chains 9^a and 9^b are connected to each other by a transverse bar 10 having its ends 36 riveted to the chains. Upon this bar the thread guide 11 with the eye 12 and the guide pin 13 are displaceably mounted. The two sprocket wheels 7^a and 7^b of the shaft 1 are rigidly connected to a journal bearing sleeve 14 and the two sprocket wheels 8^a and 8^b are rigidly connected to shaft 2, so that both the chain or sprocket wheels 7^a and 7^b, as well as the chain or sprocket wheels 8^a and 8^b may only be rotated uniformly and at the same time, the position of the guide bar 10 relatively to the chains not being changed therefore upon the propulsion of the chains 9^a and 9^b by means of the sprocket wheels 8^a, 8^b, and respectively 8^a, 8^b. The winding spool or the delivery roller for the copper wire 3 is shown at 15 as being rigidly connected to the shaft 1. Upon the delivery roller 15 a displaceable bolt 16 is arranged which as appears from Figure 1 of the drawing, may be slidingly inserted in the sprocket wheel 7^b by which means the delivery roller 15 which is rigidly

secured to the shaft 1 causes the operation of the sprocket wheels 7^a, 7^b of the chains 9^a, 9^b and of the sprocket wheels 8^a, 8^b of the shaft 2, which results in the movement of the thread guide 11. 18 is an extension of the wall of the oven upon which the guides 18^a, 18^b, 18^c, are mounted. 33 is an alarm attached on the outer side of the wall 35 of the oven. The hammer 34 forms part of a double armed lever the free end of which extends through a slot 37 in the wall into the way of a catch 13 fixed to the thread guide, when this latter is nearing the end of its course, whereby the hammer is caused to actuate the alarm in order to notify the attendant.

The insertion of a copper thread into the guide rollers and its passage through the drying oven and upon the delivery roller 15 is then effected substantially in the following manner:

The guide bar 10 which is secured to the chains 9^a, 9^b with the displaceable thread guide 11 mounted thereon, when in its position of rest, is disposed above the first groove of the first roller of the shaft 1, somewhat in the vertical position of the arrow 19. The copper thread 3 which by the action of the delivery roller is passed over the auxiliary roller 20, is secured to the eye 12, and the pair of chain or sprocket wheels 7^a, 7^b is coupled with the winding-up spool 15 by the insertion of the pin 16 into the chain wheel 7^b, and the thread guide is thereby moved as shown in Figure 2 around the guide roller 5^a in the direction of the arrow 4^a, and thence in the direction of the arrow 4^b. While the thread guide describes the half circle around the shaft 1 and the roller 5^a the copper thread 3 which is secured to the thread guide 11 in the center line of the groove of the roller 5^a becomes inserted in the groove of the roller 5^a. It then passes around the shaft 2 and the guide roller 6^a and is conducted in the direction of the arrow 4^c to the bar 18, where the pin 13 of the thread guide 11 passes in the direction of the arrow 4^d (Figure 1) into one of the grooves of the guide bars 18^a, 18^b. By means of the guide bars 18^a and 18^b the thread guide 11 is displaced upon the guide in the center line of the roller 5^b, so that the copper thread 3 upon the further movement of the thread guide 11 is inserted into the roller 5^b, and so in succession. From the roller 6^d the thread guide continues to move substantially within the plane of the arrow 19. Then the copper thread 3 is torn off from the thread guide 11, and the sprocket wheel 7^b is uncoupled from the winding-up spool 15 by the withdrawal of the pin 16. The copper thread 3 continuing its forward movement is now passed over the auxiliary rollers 21, 22 and the winding-up spool 15, so that with the uninterrupted rotation of the winding-up spool 15 the delivery of the thread is effected by the movement of said winding up spool 15. Inasmuch as the velocity of the thread guide 11 is equal to the peripheral speed of the winding-up spool 15, the copper thread 3 being therefore conducted from the start and in the regular course of operation through the varnishing liquor and the drying oven by the action of the rollers 5^a to 5^d, the copper wire becomes perfectly and regularly varnished or enameled and insulated from the first small butt-end which enters the winding-up spool 15 to the end.

There is no limitation of the number of guide rollers 5^a—5^d, and 6^a to 6^d respectively arranged side by side of each other. Instead of the chain or sprocket wheels and in place of the chains any suitable actuating and feeding means for the thread guide 11 may be employed. The thread guide 11 and the guide bar 10 may be provided with sockets for the engagement of a spring upon the displacement of the thread guide from the center of the guide roller 5^a to that of the guide roller 5^d, so as to prevent unintentional sliding backwards of the thread guide out of the center line of those guide rollers into which the thread guide 11 is moved by the guide bars.

If the thread guide is to be employed for the introduction of a new thread it is only necessary to push it back manually into the initial position of Figure 1, that is to say into the position of the roller 5^a.

A drawing-in device according to this invention may also be constructed in a somewhat modified manner, thus for example, by making use of a separate endless guide web carrying a displaceable thread guide. Besides, it is possible to employ a guide web in such a manner that it is guided in succession over all the upper and lower guide rollers, so as to insert the copper thread during its movement in the proper succession into the individual guide rollers. This endless guide web may be returned into its initial position by hand or by mechanical means.

In accordance with this invention it is of importance that the insertion of the copper thread 3 does not require the removal from the varnishing liquor of the roller system of the shaft 1 mounted therein, and that the thread 3 is conducted through the varnishing or japanning liquor and through the drying oven in the same manner and by mechanical means as with the ordinary process of operation by the winding-up of the copper wire 3 upon the spool 15, so that there is no necessity of removing the system of rollers of the shaft 2 from its operative position for carrying out the insertion or drawing-in operation.

While I have set forth my invention as be-

ing materialized in the particular construction and arrangement of apparatus herein shown and described, it is evident, that alterations and modifications both in the arrangements of parts and in the construction thereof are within the scope of my invention, and equivalent instrumentalities may be used to adapt the invention to varying conditions of application, and the invention may also be applied to the coating of other filaments, strips, bands or of similar flexible material without deviating from the spirit of my invention.

I claim:

1. In a wire and filament moving and coating device for varnishing and drying ovens, a pair of cooperating rows of guide rollers, means for moving said rollers synchronously, a thread guide capable of transverse displacement relatively to said rows of rollers and means for moving said thread guide in a closed path around both rows of rollers.

2. In a wire and filament moving and coating device for varnishing and drying ovens, particularly for electric conductors and the like, a thread guide, moving and guiding means for said thread guides, a plurality of adjacent guide rollers in the path of said thread guide, winding-up means adapted to be detachably coupled with said guide rollers, and lateral guiding means for said thread guide.

3. In a wire and filament moving device for varnishing and drying ovens, particularly for electric conductors and the like, a thread guide, two series of adjacently arranged guide rollers spaced from each other, driving and operating means for said guide rollers, and means for serially moving and guiding said thread guide around said guide rollers, and for engaging the filamentous material with the periphery of said rollers, and switching means in the path of said thread guide, adapted to transversely displace the same.

4. In a wire and filament moving and coating device for varnishing and drying ovens, comprising two series of adjacently arranged peripherally grooved guide rollers, substantially parallelly spaced from each other, operating means connecting said series of rollers, winding-up and delivery means for the filamentous material, detachably engageable with said guide rollers, filament engaging means operatively connected to said roller operating means, guiding means for said filament engaging means adapted to move said means around and in operative engagement with said guide rollers, and lateral guiding means intermediate said series of guide rollers, and engageable with said filament engaging means.

5. In a wire and filament moving and coating device two series of adjacently arranged guide rollers substantially parallelly spaced from each other, flexible operative connection between said series of rollers, rigid connecting means between said flexible connection, and a thread guide displaceably mounted on said rigid connecting means, and rotatable winding-up and delivery means detachably connected to said roller operating means.

6. In a wire and filament moving and coating device, a plurality of serially arranged guide rollers, winding-up and delivery means, operating means for said winding-up and delivery means detachably engageable with said guide rollers, a thread guide, circular and lateral guiding means adapted to move the thread guide successively into operative relation with said rollers and said winding-up means and signalling means engageable with said thread guide adapted to indicate the finishing of the drawing-in operation.

7. In a wire and filament moving and coating device, varnishing means, a drying oven, a series of adjacently arranged guide rollers in said varnishing means another series of adjacently arranged guide rollers substantially parallelly spaced from the first mentioned guide rollers, thread guiding means, operative connection between said series of rollers, and means to guide said thread guide around said guide rollers and in the axial direction thereof, and through said varnishing means and winding-up means, engageable with said rollers.

In testimony whereof I affix my signature.

WALTER OSTHOFF.