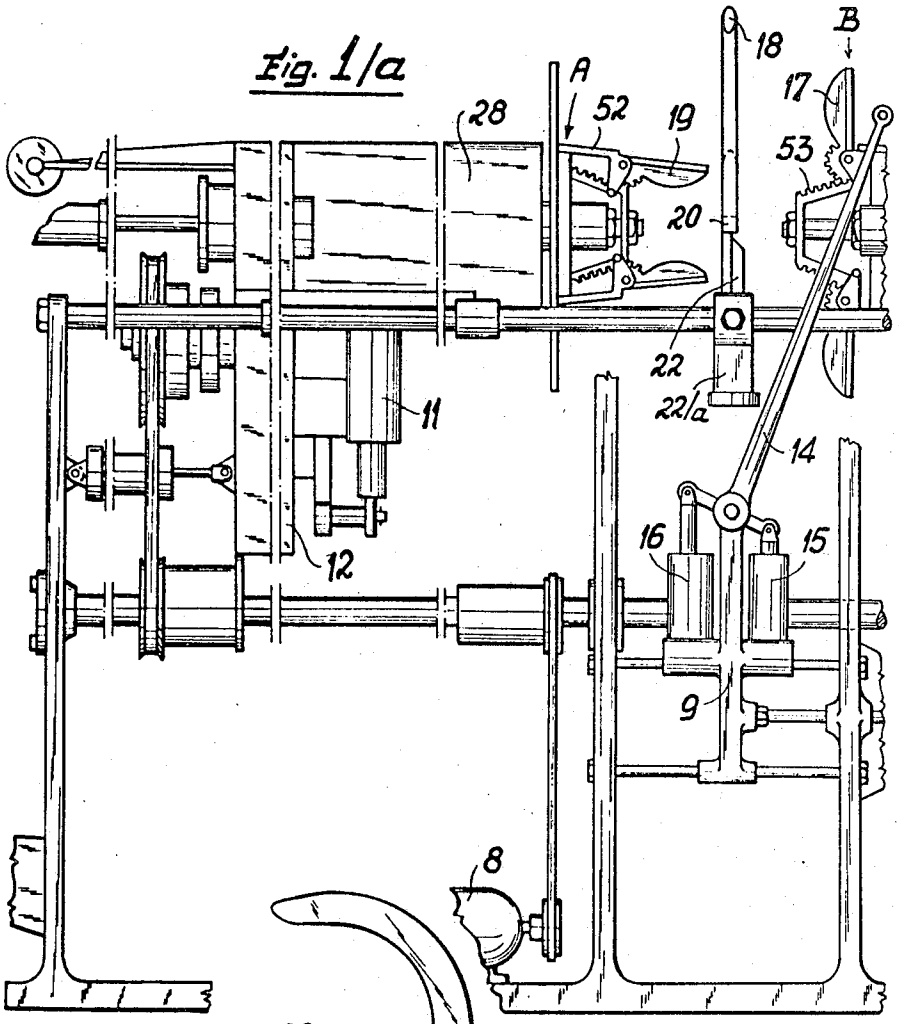
Feb. 25, 1969 A. TOSCA ETAL 3,429,346

AUTOMATIC MACHINE FOR CONTINUOUSLY WINDING UP AND LACING THREADLIKE PRODUCTS SUCH AS BARE OR COVERED WIRES AND CABLES TO COILS

Filed July 6, 1966 Sheet 1 of 4

Fig. 1/a



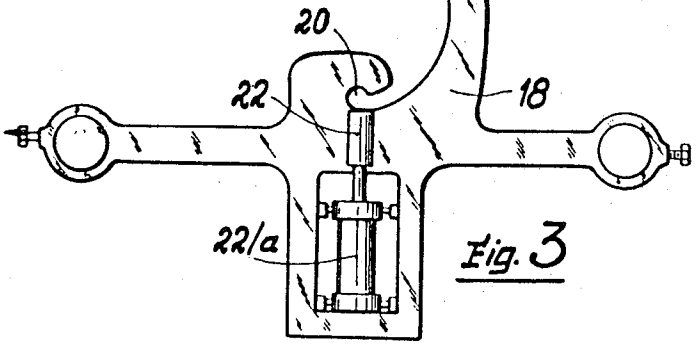


Fig. 3

INVENTORS
Alessandro Tosca
Giuseppe Pisani

BY Michael S. Striker

Feb. 25, 1969 A. TOSCA ETAL 3,429,346

AUTOMATIC MACHINE FOR CONTINUOUSLY WINDING UP AND LACING THREADLIKE PRODUCTS SUCH AS BARE OR COVERED WIRES AND CABLES TO COILS

Filed July 6, 1966 Sheet 2 of 4

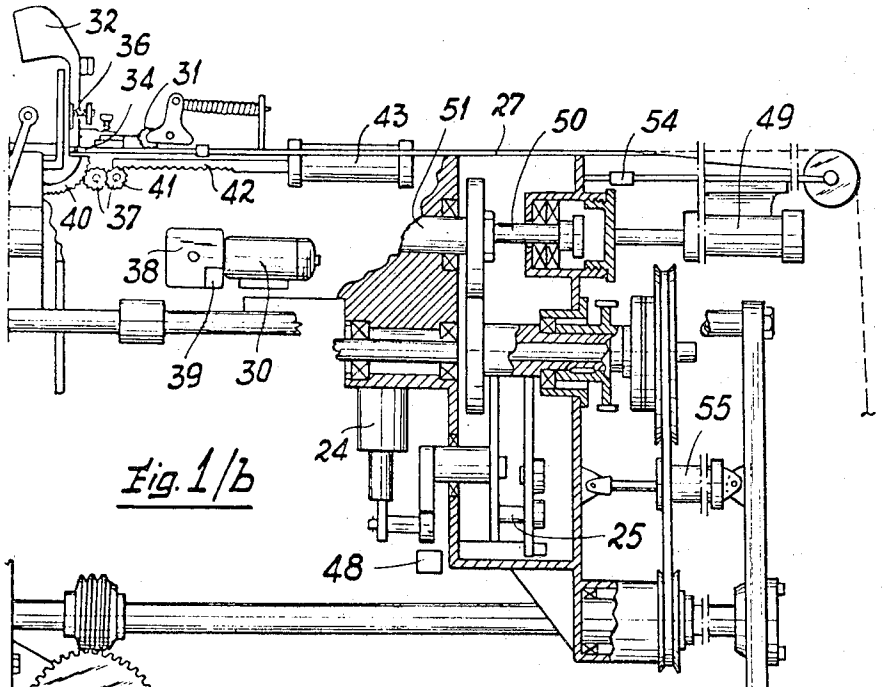


Fig. 1/b

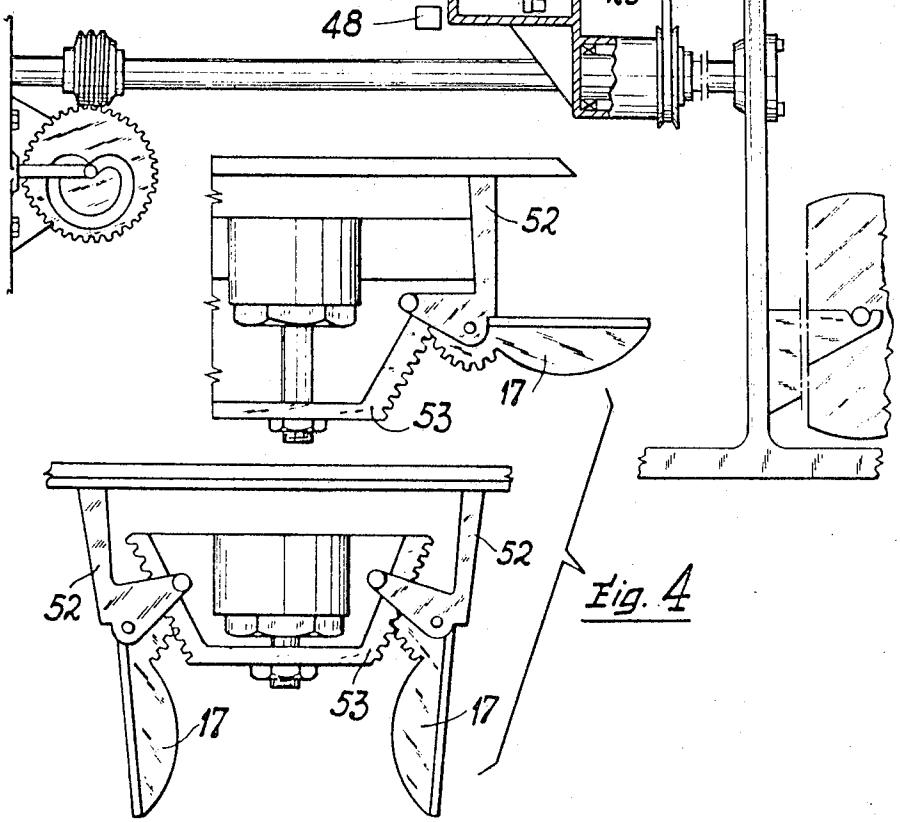


Fig. 4

INVENTORS
Alessandro Tosca
Pierpaolo Pisani

BY
Richard J. Strauss
Atty

Feb. 25, 1969 A. TOSCA ETAL 3,429,346

AUTOMATIC MACHINE FOR CONTINUOUSLY WINDING UP AND LACING THREADLIKE PRODUCTS SUCH AS BARE OR COVERED WIRES AND CABLES TO COILS

Filed July 6, 1966

Sheet 3 of 4

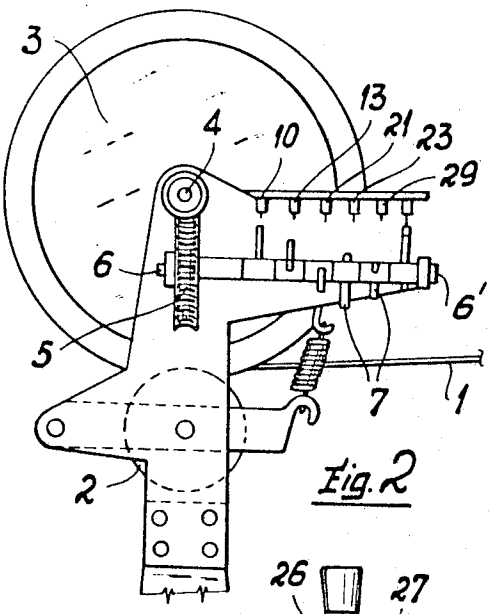


Fig. 2

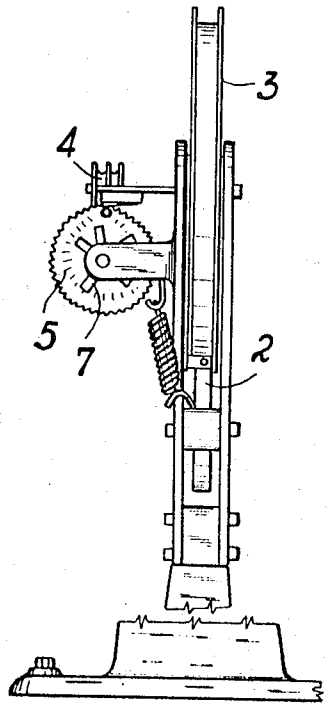


Fig. 2/a

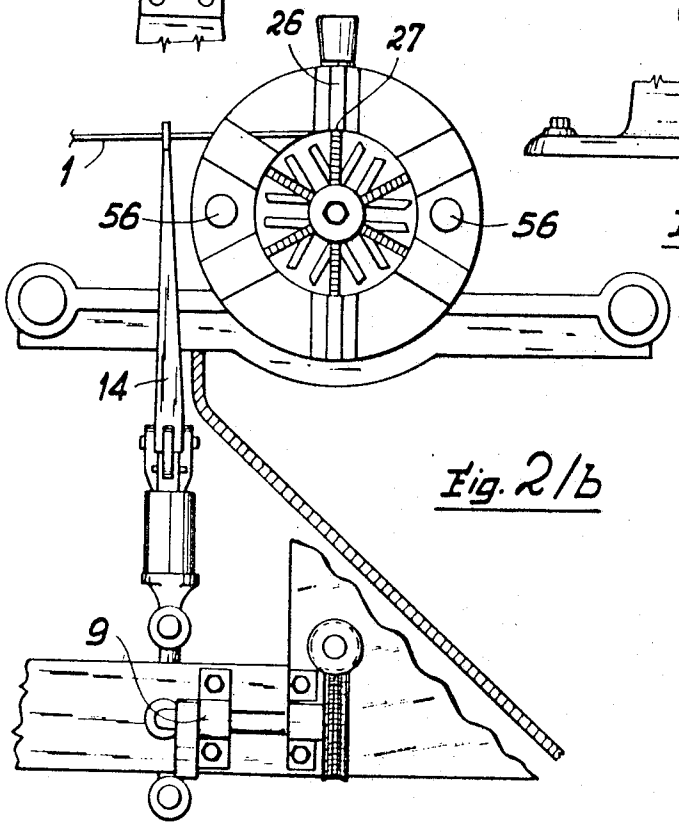


Fig. 2/b

INVENTORS

Alessandro Tosca

Giuseppe Pisani

BY Richard S. Strauss

Attorney

Feb. 25, 1969 A. TOSCA ETAL 3,429,346

AUTOMATIC MACHINE FOR CONTINUOUSLY WINDING UP AND LACING THREADLIKE PRODUCTS SUCH AS BARE OR COVERED WIRES AND CABLES TO COILS

Filed July 6, 1966

Sheet 4 of 4

Fig. 7

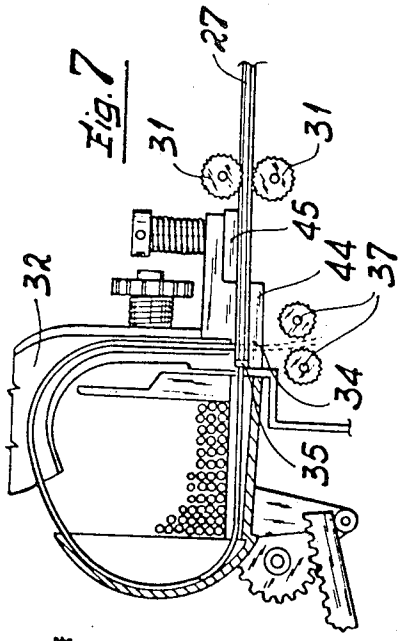


Fig. 5

Fig. 6

INVENTORS
Alessandro Tosca
Giuseppe Pisano

BY

Richard J. Stanton
Atty.

United States Patent Office 3,429,346
Patented Feb. 25, 1969

3,429,346

AUTOMATIC MACHINE FOR CONTINUOUSLY WINDING UP AND LACING THREADLIKE PRODUCTS SUCH AS BARE OR COVERED WIRES AND CABLES TO COILS

Alessandro Tosca, Salita Scaletta 2, Bergamo, Italy, and Giuseppe Pisani, Borgonuovo Val Tidone-Via Rome 49, Italy

Filed July 6, 1966, Ser. No. 563,250
Claims priority, application Italy, July 8, 1965, 6,673/65
U.S. Cl. 140—92.2 6 Claims
Int. Cl. B21f 3/04; B65h 81/00; H01f 41/06

ABSTRACT OF THE DISCLOSURE

An automatic machine for winding up and lacing of wires, cables or the like in which a guide lever controlled by electrical contact means displaces the wire from a winder supporting a completed coil onto another coaxial winder which is still empty and in which a guide provided with a cutter blade then separates the finished coil from the one which is being wound up.

It is known that electric cables of small and medium diameters and of a certain length are available on the market in the form of coils which hitherto have been manufactured by means of winding machines which operate intermittently because they have to be stopped after the winding up of each coil in order to be able to lace and remove the cable by hand. This slows down the production process which as a consequence requires a large number of workers for this particular operation as compared with the entire manufacturing process of the product.

It is the object of the invention to gain time and eliminate all manual work.

According to the present invention this object is attained in that the machine after having wound up the individual coils automatically passes over to the lacing operation by using plastic webs. During the lacing process and removal of the first coil the winding up of the second coil is carried out as long as the feeding of wire is continued from the bobbin or directly from the production machine.

An essential feature of the machine proposed by the invention consists in that two heads are provided which are arranged coaxially and symmetrically to each other in a horizontal plane. They each support a winder and rotate alternately in order to wind up the wire or cable. Both are either driven by one motor with two clutches or are separately driven by one motor each. As soon as one coil is nearly completed on one of the coil winders the other winder is actuated, the two axes of the winders being aligned. An automatic measuring device is switched on when the first coil is completely wound up. This is achieved by a contact means which causes a displacement of a guide lever for guiding the wire from the winder supporting the finished coil onto the empty winder. This simultaneously initiates the winding up of the second coil. During the axial displacement of the guide lever the wire which still connects the two winders approaches a cutting device which comprises apart from a cutting blade a sickle-shaped guide which guides the wire in the common axis of the two winders in such a manner that the wire in this position can only rotate about its own axis which rotation results from the simultaneous rotation of the two winders. Thus the wire can run against the cutting device without the risk of being damaged or displaced. After the cutting operation has been carried out the first

winder stops, whereas the second winder continues the winding operation. Then a lacing device starts operation and lays two or more windings around the coil in order to prevent that it loosens or comes undone when being released from the winder. After the lacing has been effected the head is axially displaced further towards the outside of the machine, the coil being brought simultaneously from a cylindrical shape to a conical shape. The radial arms which form the external sides of the winder are simultaneously retracted through 90° so that they are arranged in parallel with regard to the main axis of the machine and thus the coil is released by means of two rods which are constructed as withdrawing device. The winder runs against these two rods when being axially displaced. Then the coil is dropped into a collector or onto a conveyor belt.

After the removal of the laced coil the winder resumes its initial position by carrying out an axial displacement in the direction opposite to the displacement just performed and simultaneously expands its coil from the conical into the cylindrical shape and repeats the operation by rearranging the arms forming the core into vertical positions in order to perform rotation and the winding up of a new coil. When the coil which has just been wound up is nearly finished, i.e. when only a few meters are missing to make up the predetermined length, a circuit is closed by means of the measuring device which actuates the winder e.g. by means of a friction clutch after the coil has been removed from the winder. After having obtained the exact length of the coil a second circuit is closed which causes the displacement of the wire guide from the winder just filled to the other winder to be filled. Thus the operation is repeated as described and continued as long as the wire is being fed.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

FIGS. 1/*a* and 1/*b* are schematic vertical elevational views, partly in section, of the entire construction of the machine according to the invention;

FIGS. 2, 2/*a* and 2/*b* show the path of the wire from a storage reel or a production machine to the head of the winder through the intermediary of a measuring and counting device, a compensator and collector being inserted;

FIG. 3 is a detail of a sickle-shaped guide provided with a cutting blade;

FIGS. 4 and 4/*a* are details of the winding head in two positions and of the cylindrical coil core having arms being shown in winding and in releasing positions;

FIG. 5 shows a special elastic web for lacing the coil;

FIG. 6 is a detail of the lacing device, and

FIG. 7 shows the entire course of the web which is ready to be threaded through its ear as soon as it has reached its final position.

The wire or cable which is to be wound into coils is fed from a storage reel or production machine, passes through a normal compensating and collecting device provided with different pairs of pulleys. While said device accumulates the wire it compensates the differences in speed which are due to the increase in diameter during the winding up of the coils whereas the speed of the feed remains constant.

From the compensating device the wire **1** passes through a measuring device (FIG. 2) comprising two contacting pulleys **2**, **3**. The pulley **2** is arranged below the pulley **3** and supports the wire **1**. The pulley **3** has a circumference of one meter and is connected to a worm **4** which is in mesh with a worm wheel **5** provided with one hundred teeth forming gaps of metrical subdivision. The worm wheel **5** is mounted on one end of a shaft **6** the free end **6'**

of which carries cams 7 for opening and closing the different circuits.

The process of winding the coils is initiated on one of two symmetrically arranged winders A and B (FIG. 1/a). The end section of the wire is fixed by hand e.g. to the winder B. Then a motor 8 of the machine is actuated. The winder A remains at a standstill. A wire guide 9 the working range of which is equal to the effective working width of the winder distributes the wire on the rotating winder. Shortly before the coil is finished on the winder B the winder A starts rotating which is achieved by closing a circuit 10 (FIG. 2) through the intermediary of one of the cams 7 of the measuring device through which the wire always passes which releases an arresting device 12 (FIG. 1/a) by actuating an electromagnet 11.

When the coil on the winder B has reached the desired length a second circuit 13 (FIG. 2) of the measuring device is closed. This circuit deenergizes an electromagnet 15 (FIG. 1/a) and energizes an electromagnet 16 so as to cause the quick displacement of a guide lever 14 of the wire guide 9 in transverse direction and transmit the wire to the winder A. Due to this displacement of the guide lever 14 the wire leaves the winder B by passing over arms 17 of the winder B and changes over to the winder A after having passed a sickle-shaped guide 18 which is provided with a cutting blade 22. The rotating winder A has arms 19 one of which engages the wire and pulls it into rotary movement in order to initiate the winding up of the second coil. The wire is still connected to the two synchronously rotating winders and extends through the sickle-shaped guide 18 which causes the wire to move to its center 20 where the wire is only rotated about its longitudinal axis. Then the measuring device closes a third circuit 21 which actuates the cutting blade 22 of the guide 18 e.g. by means of an oil pressure piston 22a and cuts the wire so that the two coils which were connected up to this point are separated.

After the cutting operation has been carried out the winder B is stopped by a fourth circuit 23 of the measuring device (FIG. 2) which by means of an electromagnet 24 causes the latching of an arresting device 25 so that the winder is safely stopped in the predetermined position either by means of one of a pair of grooves 26 (FIG. 2/b) which are arranged on the external flange or on the core, said grooves 26 corresponding to a passage 27 for the lacing web which is released from a lacing group 28 which is arranged in the stationary part of the machine directly on the winder.

By closing a fifth circuit 29 of the measuring device (FIG. 2) a small motor 30 (FIG. 1/b) of the lacing group 28 is actuated which by means of a series of gears actuates pairs of knurled wheels 31 which advance the lacing web which, while running through the groove 26 arranged on the sector of the corresponding core and onto the corresponding arm, completely wind up the coil until it has reached the point where it enters a funnel 32 for the web. At one pont the web forms an ear 33 (FIG. 5). As soon as the web has reached its final position in a housing 34 in the passage 27 another circuit 35 (FIG. 7) is closed which stops the web and which in the funnel 32 sets in motion another group of knurled wheels 36 (FIG. 6) which grip the leading end of the web and push it through the ear 33. Below the ear 33 a further group of knurled wheels 37 are arranged which grip the leading end of the web in order to tighten it around the coil.

Simultaneously the funnel 32, which consists of two halves, opens in order to release the web. When the web is tightened to a certain degree a friction clutch 38 (FIG. 1/b) is operated which through the intermediary of an interruptor 39 stops the motor 30 and thus also the knurled wheels 37 as well as the movement of a gear sector 40 by means of a piston 43 through gears 41 and a rack 42.

The gear sector 40 pushes the ear 33 of the web against the coil and tightly laces it. The gear sector 40 is provided with a web cutting edge 44 at the height of the housing 34, which edge co-operates with a counter-blade 45 which is arranged above the passage 27. The end section of the web remaining after the lacing operation and which is still held by the knurled wheels 37 is cut off by the cutting edge 44 which is actuated by the gear section 40 when returning into its rest position. When the rack 42 returns into its position of rest it closes a circuit 47 which releases the arresting device 25 together with the electromagnet 24 and thus actuates the winder B. The latter, however, is stopped after half a rotation of the arresting device 25 by means of the electromagnet 24 which has again been energized due to the closure of the circuit of an interrupter 48.

When the winder B has rotated through 180° it has reached the position where the groove for the passage of the lacing web is opposite the passage 27. The device which stops the coil in the exact position for the lacing operation is the same which has arrested the winder in the preceding lacing operation.

As soon as the winder stops in the second lacing position the operation of the lacing group is initiated which is the same as already carried out during the first lacing operation.

After the second lacing operation has been carried out, the circuit 47 is closed whereby an oil pressure cylinder 49 (FIG. 1/b) is actuated through a valve which is electrically operated. The oil pressure cylinder 49 entrains a shaft 50 and runs through a hollow shaft 51 of the winder whereby the arms 17 are opened and sectors 52 together with the core and a radial rack 53 are contracted.

Thereafter the circuit of an interrupter 54 is closed and thereby all elements of the winder returned through the intermediary of a cylinder 55 into their initial positions. During this return movement of the winder the coil is engaged by two fixed withdrawing devices which through bores 56 in the flange push the laced and compact coil off the core. The coil is then dropped onto a chute below the winder from where it is directly or through a constantly running conveyer belt transported into a collector.

After the coil has been discharged the winder is axially displaced into its normal position. The arms 17 or 19, respectively, are brought into radial positions in order to resume rotating and winding up a new wire. This is initiated before the winding-up operation of the other winder is completed. In this manner the operation is carried out without interruptions and one coil after the other is manufactured by alternately operating the two winders A and B.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. An automatic machine for continuously winding up and lacing a threadlike and flexible product, particularly a wire or cable of small or medium diameter, said machine comprising two symmetrically and coaxially arranged heads and a winder supported by each of said heads, said winders being constructed to alternately wind up the product; an electrical contact controlled guide lever for displacing the product from the winder supporting a completed coil onto the winder which is still empty; and a guide provided with a cutting blade for separating the finished coil from the one which is being wound up.

2. An automatic machine as claimed in claim 1, wherein a measuring device, a series of electric contacts and a number of cams are provided for automatically subjecting the wound up coil to at least two lacing operations on the winder by means of special plastic webs.

3. An automatic machine as claimed in claim 2, where-

in after the separation of the two coils the winder supporting the completed coil is stopped by means of an arresting device in such a position that a groove provided in the exterior flange and in the core of the winder is in alignment with the guide passage for the plastic web so that by means of a motor the web is advanced by pulling means until the coil is wound up, the passing of the leading end of the web through an ear provided in its trailing end being effected by pulling means and the tightening of the coil being carried out by means adapted for cutting off the excess end portion of the web.

4. An automatic machine as claimed in claim 3, wherein after the first lacing operation the disengagement of the arresting device causes the rotation of the winder through 180° placing it into the second lacing position, this lacing operation being carried out in the same manner as the first one.

5. An automatic machine as claimed in claim 4, wherein after carrying out the lacing operations the head is again axially displaced and the core is simultaneously contracted from cylindrical shape to conical shape and arms pivoted to the winders are moved in positions parallel relative to the longitudinal axis of the machine

in order to release the laced coil from the winder by means of two withdrawing devices.

6. An automatic machine as claimed in claim 5, wherein each winder returns into its normal working position after having reached the position for releasing the laced coil, the arms being arranged in vertical direction and the core being cylindrical, in order to start rotating again and to resume the winding up of a new coil, before the other winder has completed the winding up and lacing of its own coil.

References Cited

UNITED STATES PATENTS

2,053,764	9/1936	Chapman	140—92.2
2,698,033	12/1954	Ammann et al.	140—92.2
3,065,772	11/1962	Amey	140—92.2
3,108,922	10/1963	Possis et al.	140—92.2

CHARLES W. LANHAM, *Primary Examiner.*

L. A. LARSON, *Assistant Examiner.*

U.S. Cl. X.R.

29—605