Sept. 18, 1962 M. A. NYE 3,054,570

WIRE PACKAGING MACHINE

Filed Dec. 15, 1960

2 Sheets-Sheet 1

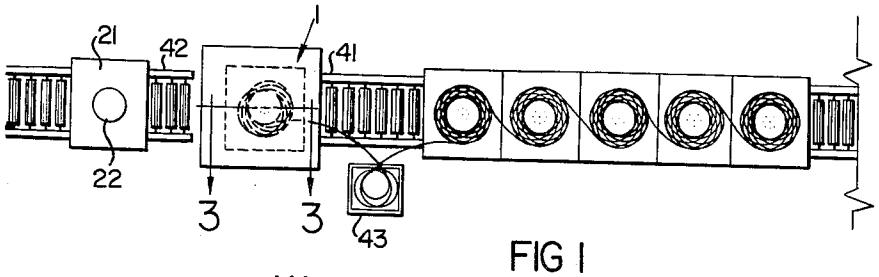


FIG 1

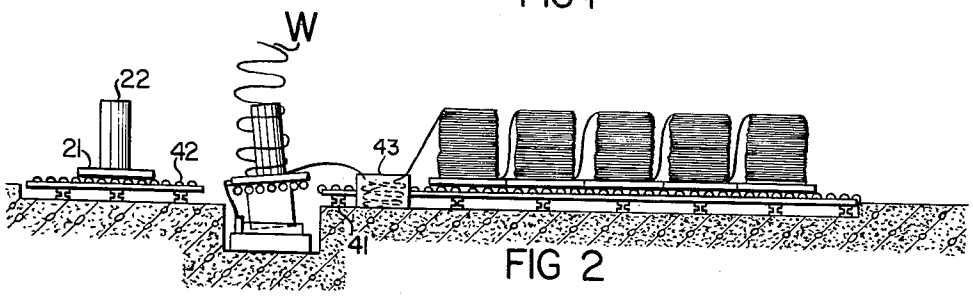


FIG 2

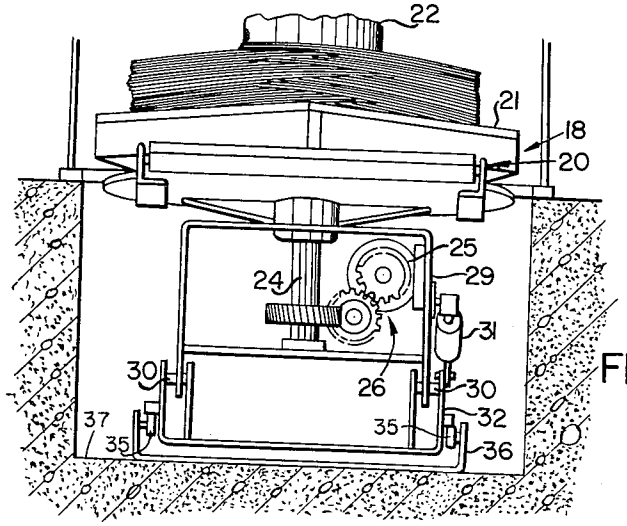


FIG 4

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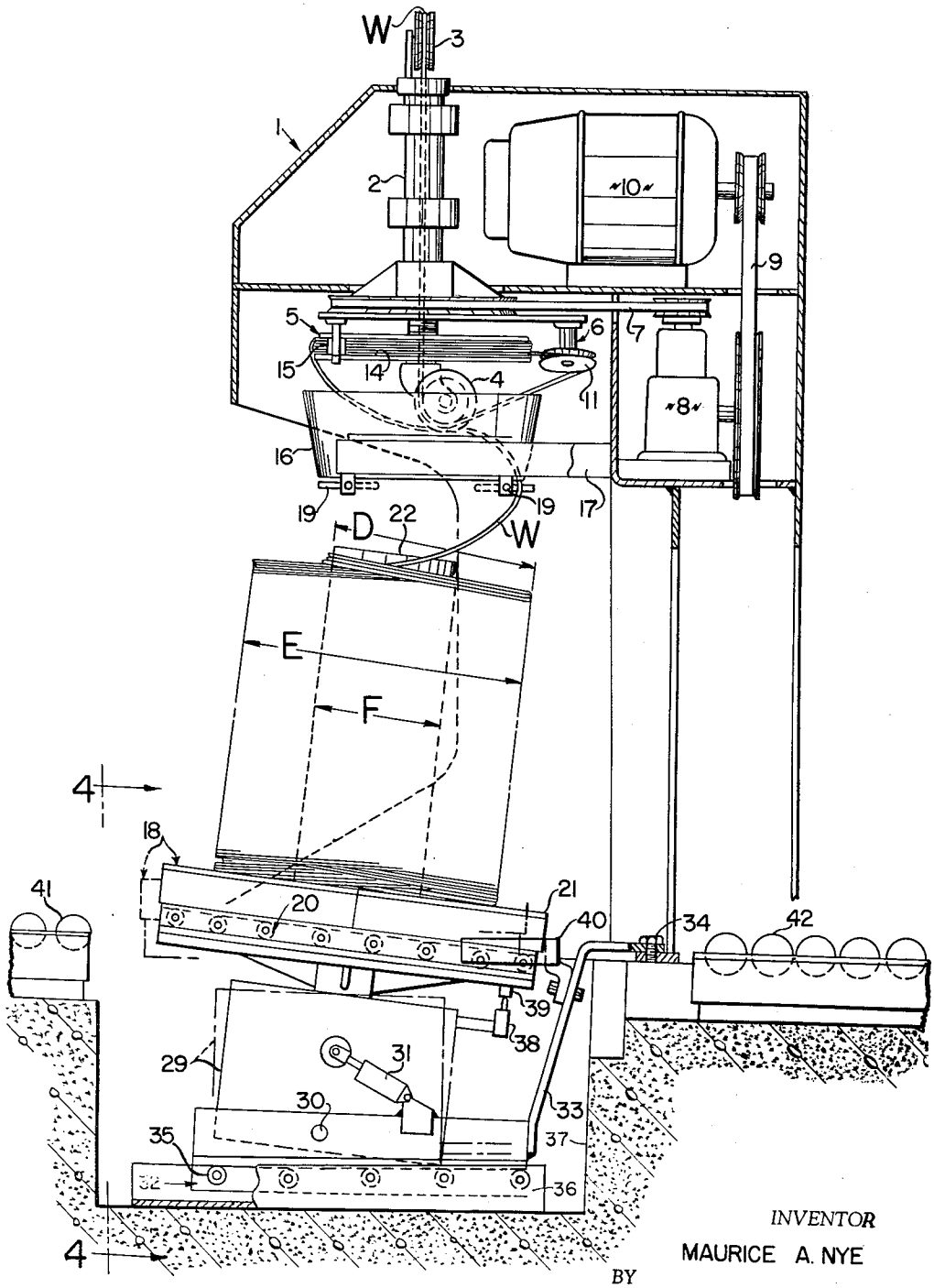


FIG 3

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WIRE PACKAGING MACHINE

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10 Claims. (Cl. 242—83)

The present invention relates generally as indicated to a wire packaging machine and more particularly to a wire packaging machine by which a series of neat and compact packages or coils are produced from a continuous length of wire.

In the wire packaging art it is known to provide wire takeup or draw blocks and wire receivers that are relatively rotated at varying speed ratios so as to form convolutions of varying diameter, thereby tending to make the coils compact and neat. However, such neat packaging of wire involves the use of a complicated and expensive variable drive system and, moreover, it is possible only to form one coil at a time owing to the rotation of the wire receiver and, therefore, when the packages are used it becomes necessary to weld the trailing end of the wire from one package to the leading end of the wire of the next package thereby consuming extra labor and equipment and often requiring the shutting down of the drawing or like equipment at which the packages are payed off.

Neat and compact individual packages are also produced as by equipment disclosed in the Haugwitz Pat. No. 2,886,258 wherein the convolutions descending by gravity from a vertical takeup block are laid in helical progression on a platform by means of a slowly rotating eccentric arm disposed beneath the takeup block and above the wire loop receiver. Packages of the type with which the present invention is concerned are also disclosed in the copending application of Jess C. Bittman, Serial No. 829,606, filed July 27, 1959, now Pat. No. 3,013,742, granted December 19, 1961 wherein the wire convolutions descending from the takeup block drop down onto a slowly rotating, tilted and offset receiver whereby the wire convolutions or loops are collected in circular progression to form neat and compact packages or coils. However, because of the rotation of the receiver as aforesaid, it is possible to make only one package at a time, whereby in a high speed drawing operation or the like wherein the wire may be payed off at a rate exceeding 3000 ft./min. such single package lasts only a short time. Thus it becomes necessary to frequently weld the trailing end of one package to the leading end of the next package with consequent expenditure of extra labor and provision of welding equipment and, in addition, the high speed drawing equipment may have to be periodically shut down.

In view of the foregoing, it is one principal object of this invention to provide a wire packaging machine which does not require the use of complex speed varying means because the machine herein is, in essence, a dead block-dead coil machine except for the provision of the turntable beneath the takeup block which is arranged to be very slowly rotated about an axis which is tilted and offset with respect to the axis of the takeup block. In this way the uniform diameter convolutions of wire descending by gravity from the takeup block are laid neatly and compactly in circular progression to form an annular package which is of outside diameter larger than the diameter of the individual convolutions. A package thus formed is very compact in that it contains a great weight of wire in relation to its diameter and height and, moreover, with the present machine and method one package after another may be produced from a single continuous length of wire to thus satisfy the demands of high speed payoff operations without interruption.

It is another object of this invention to provide a wire packaging machine wherein the wire loop receiving turntable is rotated in opposite directions about its tilted axis to build up the desired neat and compact package while sufficient slack is provided in the wire from the previously made package to accommodate such opposite direction rotation of the turntable, whereby any number of packages composed of a single continuous length of wire may be made up.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

FIG. 1 is a top plan view somewhat diagrammatic in form illustrating the present machine and method with which and by which any number of coils or packages may be successively made from a single continuous length of wire;

FIG. 2 is a front elevation view of the machine shown in FIG. 1, except that the takeup block disposed above the tilted turntable has been omitted;

FIG. 3 is an enlarged vertical cross-section view of a preferred form of packaging machine, such section having been taken substantially along the line 3—3, FIG. 1; and

FIG.4 is an elevation view of the lower portion of the machine as viewed along the line 4—4, FIG. 3.

Referring now in detail to the drawings, and first especially to FIGS. 3 and 4, the same comprises a head or housing 1 having a vertical tubular shaft 2 fixed therein with a sheave 3 at the top and with a swivel sheave 4 at the bottom. The takeup block assembly 5 herein may be of conventional form mounted as a dead block on such fixed tubular shaft 2. This takeup block assembly 5 may be of the type disclosed in the copending application of Jess C. Bittman, Serial No. 829,605, filed July 27, 1959, now Pat. No. 3,013,741, granted December 19, 1961 wherein a plurality of nested blocks have threaded engagement with the shaft 2 so that one or more of the outer ones may be screwed upwardly to expose an inner one of smaller diameter.

Journalled on the fixed tubular shaft 2 is the flyer assembly 6 which is arranged to be rotated about the axis of the takeup block 5 as by means of the belt drive 7 from the speed reducer 8, which speed reducer, in turn, is belt-driven as at 9 by the electric drive motor 10 which is mounted in the head 1. The flyer assembly 6 is provided with a sheave 11, whereby as the flyer assembly 6 is rotated, the wire W passing over the top sheave 3, through the shaft 2, over the swivel sheave 4, and over the sheave 11 as shown, is wrapped on the takeup block at the beveled shoulder 14 thereof, whereby the convolutions will be progressively shoved upwardly until the top convolution clears the pressure roller 15 on the flyer assembly 6 which holds the convolutions against the periphery of the block 5. As the flyer assembly 6 thus rotates, the successive top convolutions of wire W are free to continuously gravitate through the funnel-shaped guide 16 mounted on the arms 17 of the head 1 onto the top surface of the turntable 18. The aforesaid funnel support arms 17 are also provided with accumulator fingers 19 which may be swung about vertical axes to position the fingers 19 in the path of descent of the wire convolutions from the takeup block 5, thereby to accumulate in the

guide a number of turns of the wire W to permit removal of a completed coil or package from the turntable **18** preparatory to starting the next coil. When the completed coil has been removed, the fingers **19** may be swung out from under the convolutions of wire W accumulated thereon, whereby the hank of convolutions drops down to the turntable **18**, the flyer **6** being operated continuously.

The turntable **18** herein may be provided with a roller conveyor **20** to facilitate removal of a completed coil supported on the platform **21** and around the coaxial core or guide means **22** thereof. In the operating position of the turntable **18** it has an axis of rotation which is offset from the axis of the takeup block **5** and inclined from vertical as shown.

The inclination of the turntable **18** and the length of the guide means **22** is such that the upper end thereof is at a zone to be engaged by one side of the wire convolutions as they pass down from the takeup block **5** through the guide funnel **16**. In this way the convolutions will slide down guide means **22** and thereby be displaced laterally to form a neat cylindrical package of diameter equal to twice the diameter of the convolutions minus the diameter of the guide means **22**.

The turntable **18** is provided with a center shaft **24** by which it is driven as through an electric motor **25** and suitable gearing **26**, at a very slow speed in relation to the speed of the flyer **6**. For instance, the ratio of speed of the flyer **6** with respect to the speed of the turntable **18** may be on the order of 800:1. It has been found that in a machine employing a 4 H.P. D.C. drive motor **10** for the flyer **6** requires only a ⅛ H.P. D.C. motor **25** to drive the turntable **18**, even when a large coil of 2,000 lbs. weight is to be made.

As bests hown in FIG. 3, the convolutions of diameter D engage the side of the guide means **22** and slide down therealong to build up on the coil support platform **21**. Because the turntable **18** is rotating slowly, the convolutions will be laid in circular progression to produce a neat and compact coil which has an outside diameter E and an inside diameter F corresponding to the diameter of guide means **22**. By way of example, a coil of 31″ outside diameter E, 11″ inside diameter F, and of 17″ height when formed of 16½ gauge carbon steel wire, has a weight of about 1250 lbs. Thus, it is possible to build up heavy coils which are neat and compact and from which the wire can easily be payed off without tangling or snarling. The aforesaid 2000 lb. coil would have a height of about 40″ and outside and inside diameters of 29″ and 14″ respectively, while the wire convolutions are of about 22″ diameter D.

It is to be noted that the turntable **18** and its support housing **29** are mounted on a horizontal pivot **30** for movement as a unit to position the top of the turntable **18** in a horizontal plane as by means of the pneumatic cylinder **31**. Furthermore, the member **32** carrying the horizontal pivot shaft **30** is adjustable to shift the turntable axis closer to, or farther away from, the vertical axis of the takeup block **5**. Said adjustable member **32** has an arm **33** which may be secured, as by the screw **34**, at different positions. The member **32** may be supported as on the rollers **35** of a member **36** fixed in the bottom of the floor well **37**.

The machine herein may be provided with a suitable start-stop push button, a speed control device, and a suitable valve and piping for actuating the cylinder **31**, these controls and the wiring and piping diagrams not being shown herein since they may be conventional.

The motor **25** which slowly rotates the turntable **18** as aforesaid, is reversible and mounted on the base or housing **29** of the turntable **18** is a motor reversing switch **38** which is actuated after each revolution of the turntable **18** by a cam **39** on the latter, whereby the turntable **18** will be driven in one direction for one revolution whereupon the cam **39** will actuate the reversing switch **38** to reverse the electric drive motor **25** to drive the turntable **18** in the opposite direction for one revolution until the cam **39** again actuates the reversing switch **38**.

Generally, the roller conveyor **20** has sufficient friction to retain the platform **21** and guide means **22** thereof in tilted position without sliding but, if desired, or necessary, there may be provided at the mouth of the floor well **37** a fixed ring or stop shoe **40** which is engaged by the lower side of the platform **21** as it rotates slowly about the tilted and offset axis.

In order to form a series of packages from a single continuous length of wire W it is herein contemplated to provide roller conveyor sections **41** and **42** on either side of the turntable **18** whereby a platform **21** and guide means **22** with a completed package may be shifted onto the conveyor section **41** and replaced by an empty platform **21** and guide means **22** from the other conveyor section **42** as best shown in FIGS. 1 and 2. When a completed package is thus shifted to the right, as viewed in FIGS. 1 and 2, several of the top loops of wire W from the just completed package are placed in a suitable receptacle or tray **43** disposed adjacent to the wire packaging machine **1**, whereupon the hank of accumulated convolutions on the fingers **19** may be allowed to drop down over the tilted guide means **22** and onto the platform **21** for commencing of the formation of a package of required size on such empty platform **21** and guide means **22**. As the turntable **18** slowly rotates in opposite directions the several loops of wire W in the tray **43** alternately become smaller and larger in diameter.

From the foregoing it can be seen that the present method can be carried on indefinitely to produce any desired number of packages from a single continuous length of wire W and thus wire drawing machines, annealers, or other equipment to which the wire is supplied, may be operated for extended periods of time without necessity of periodic shutdown for package replacement or for welding of the trailing end of one package to the leading end of the next package.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a wire packaging machine, the combination of a takeup block arranged to have wire coiled thereabout with the convolutions descending by gravity therefrom; a support for accumulating such convolutions in the form of an upwardly growing package; and means operative periodically to rotate said support in opposite directions about an upwardly extending axis that is offset with respect to the axis of the descending convolutions whereby the convolutions are laid neatly and compactly in circular progression on said support to form an annular package of outside diameter larger than the diameter of the individual convolutions and whereby successive packages may be formed from a single continuous length of wire by providing slack in the wire between the top of the previously formed package and the package being formed.

2. The machine of claim 1 wherein the axis of rotation of said support is inclined from vertical, said support having guide means effective to guide the convolutions so that they drop down on the low side of said support and on the low side of the package as it grows.

3. The machine of claim 1 wherein said support has guide means effective to cause the descending convolutions to accumulate eccentrically with respect to the axis of rotation of said support.

4. The machine of claim 1 wherein an accumulator is disposed between said block and support, said accumulator being operative to arrest the descent of the convolutions and thus to accumulate a hank of convolutions for subsequent release to said support.

5. In a wire packaging machine, the combination of a fixedly mounted takeup block; a flyer mounted for ro-

tation about said block and including wire guide means operative to wrap wire around said block to form convolutions which descend by gravity from said block; a support disposed at a level below said block for accumulating such convolutions in the form of an upwardly growing package; and drive means operative periodically to rotate said support very slowly in opposite directions in relation to the speed of said flyer about an upwardly extending axis that is offset with respect to the axis of the descending convolutions whereby the convolutions are laid neatly and compactly in circular progression on said support to form an annular package of outside diameter larger than the diameter of the individual convolutions and whereby successive packages may be formed from a single continuous length of wire by providing slack in the wire between the top of the previously formed package and the package being formed.

6. The machine of claim 5 wherein the axis of rotation of said support is inclined from vertical, said support having guide means effective to guide the convolutions so that they drop down on the low side of said support and on the low side of the package as it grows.

7. The machine of claim 5 wherein said support has guide means effective to cause the descending convolutions to accumulate eccentrically with respect to the axis of rotation of said support.

8. The machine of claim 5 wherein an accumulator is disposed between said block and support, said accumulator being operative to arrest the descent of the convolutions and thus to accumulate a hank of convolutions for subsequent release to said support.

9. In a wire packaging machine, the combination of a housing; a vertical takeup block dependingly secured

to said housing; a flyer journalled in said housing for rotation about a vertical axis and including wire guide means operative to wrap wire around said block to form convolutions which descend by gravity from said block; a support disposed beneath said block and flyer for accumulating such convolutions in the form of an upwardly growing package; and drive means operative periodically to rotate said support very slowly in opposite directions in relation to the speed of said flyer about an upwardly extending axis that is offset with respect to the axis of the descending convolutions whereby the convolutions are laid neatly and compactly in circular progression on said support to form an annular package of outside diameter larger than the diameter of the individual convolutions and whereby successive packages may be formed from a single continuous length of wire by providing slack in the wire between the top of the previously formed package and the package being formed.

10. The machine of claim 9 wherein a receptacle is provided adjacent to said support to accommodate several convolutions of slack wire which alternately increase and decrease in diameter as said support is thus rotated in opposite directions.

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