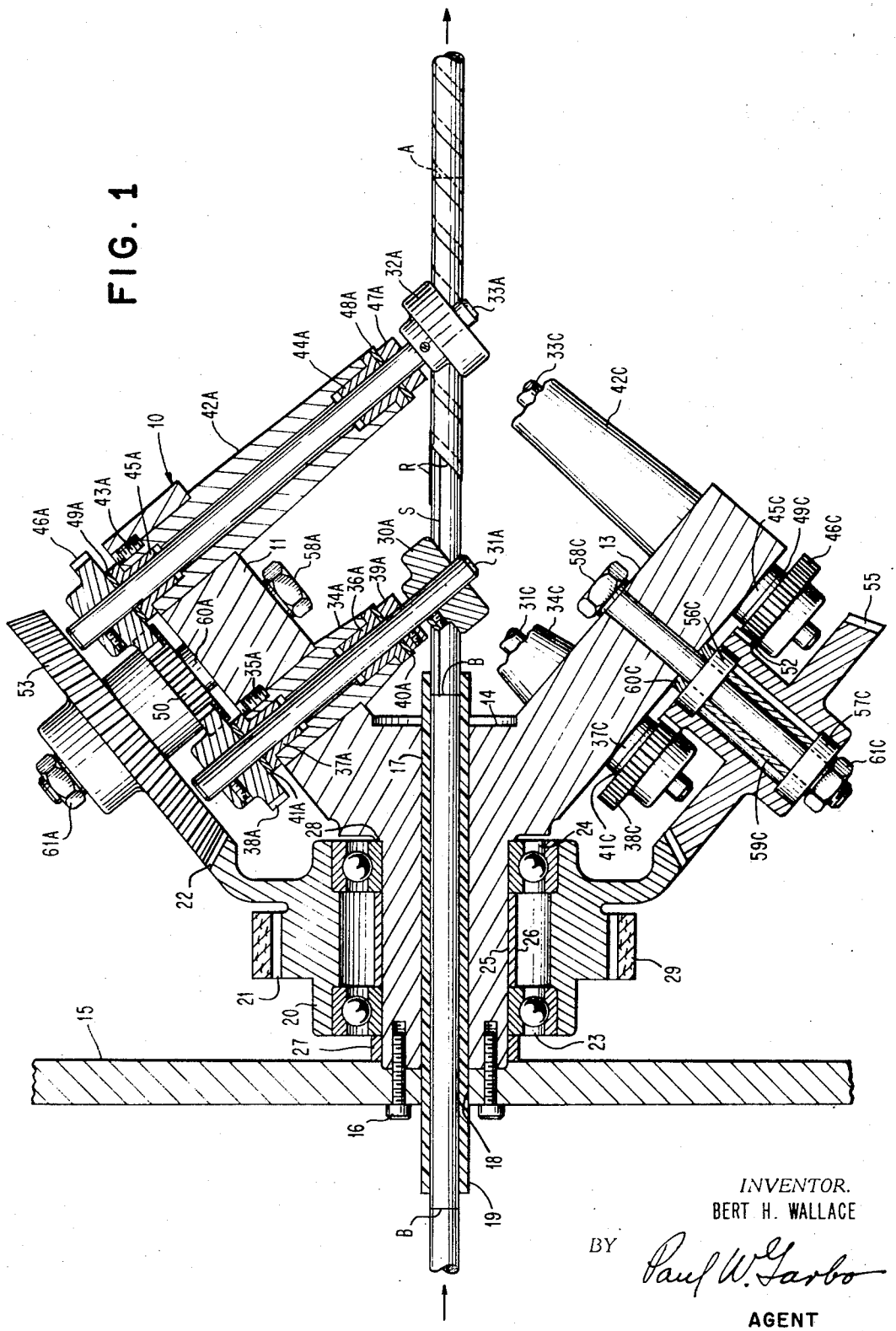
Sept. 16, 1969 B. H. WALLACE 3,467,108

HELICAL MOVEMENT OF CYLINDRICAL OBJECTS

Filed May 16, 1966 2 Sheets-Sheet 1

FIG. 1

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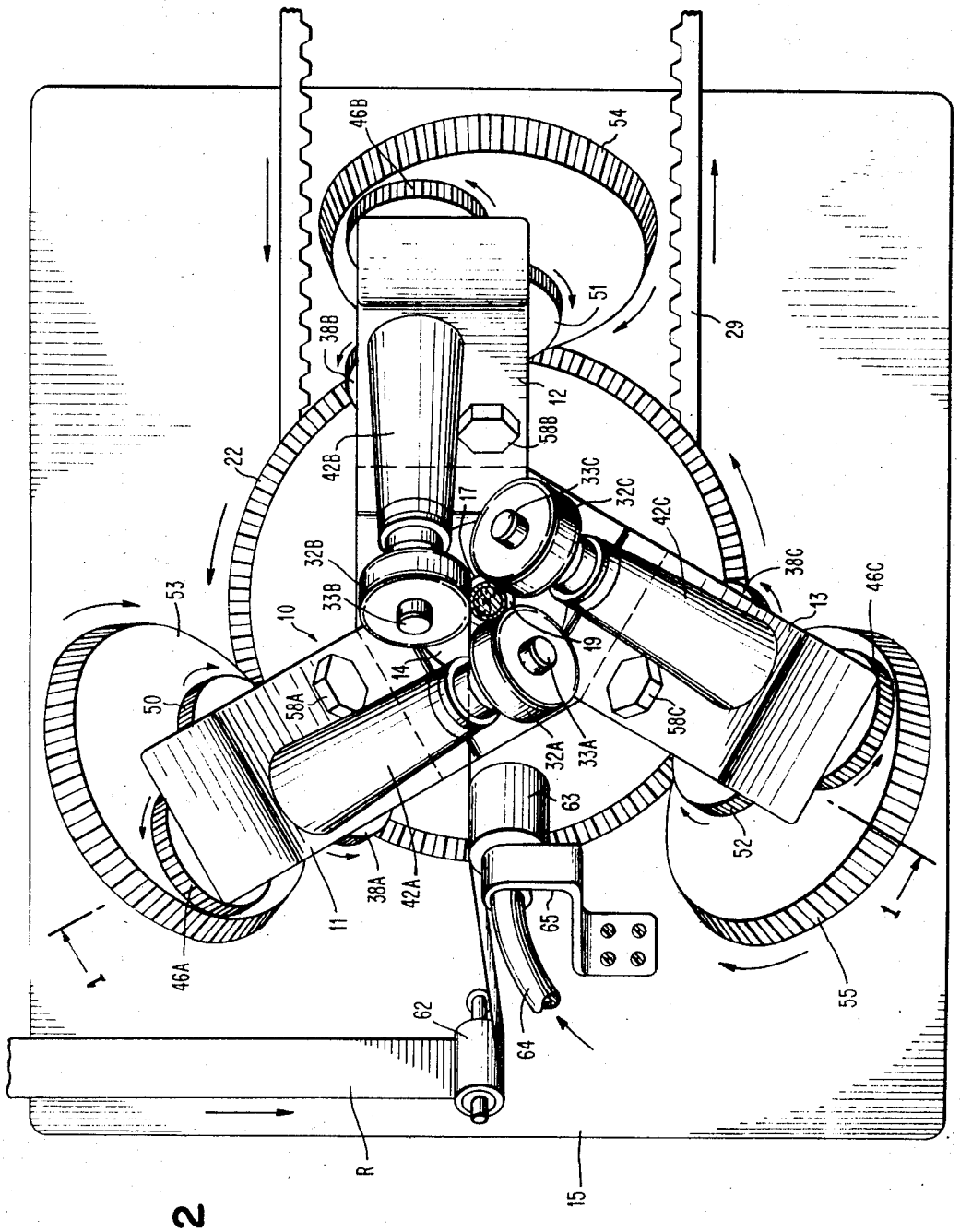


FIG. 2

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# HELICAL MOVEMENT OF CYLINDRICAL OBJECTS

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Int. Cl. A24c 1/22, 1/30
U.S. Cl. 131—20 16 Claims

## ABSTRACT OF THE DISCLOSURE

In a machine, cylindrical objects are helically moved by passing them longitudinally through an elongated guide which extends through a base having three equidistantly spaced arms each of which supports two shafts with rollers mounted on their free ends. The shafts are uniformly rotated and converge closely toward the axis of the objects discharging from the guide so that the rollers contact the cylindrical surface of the objects to impart both rotational and translational movement to the objects. The machine is particularly useful in manufacturing cigars.

This invention relates to the helical movement of cylindrical or rod-shaped objects, and more particularly to the continuous application of a helical wrapping on rod-shaped objects while undergoing helical movement as in the case of helically wrapping a ribbon of tobacco sheet on a series of cigar bunches aligned end to end.

Prior mechanisms for applying a helical wrapping on cigar bunches are well-known in the art. Conventionally, cigar machines individually wrap single or double length bunches at rates ranging from about 12 to 36 cigars per minute. Modifications have been made on the conventional cigar-making machine to adapt it to feed web segments from a continuous roll of a tobacco sheet for the purpose of wrapping cigars, but this still entails the principle of individually machine-wrapping single or double length cigar bunches. To increase substantially the number of cigar bunches wrapped per unit of time involves a different method of feeding cigar bunches to a wrapping device. A machine for axially conveying and simultaneously rotating rod-shaped objects, such as cigar bunches made on a cigarette-making machine, has been disclosed in U.S. Patent 3,135,406; that machine involves two spherical rolls journalled on opposite sides of the conveying path at a predetermined angle so as to impart an axial conveying motion combined with axial rotation of the rod-shaped objects or cigar bunches. British Patent 856,082 discloses a multiple belt system for applying a wrapper onto a cigar bunch whereby one pair of belts advances the bunch longitudinally while a transversely positioned pair of belts imparts axial rotation to the bunch and still another belt supplies a tobacco sheet at a 45° angle to the advancing and rotating bunch.

An important object of high-speed wrapper rolling, where it is possible to wrap hundreds of bunches per minute, is to provide a well-defined straight path through which each cigar bunch is conveyed with simultaneous rotation but free of the swaying that is inherent in the two devices of the prior art just discussed. By defining a straight unswerving path for the cigar bunch, the band or strip of tobacco sheet is pulled from a roll thereof at a constant rate thereby minimizing tearing of the relatively tender strip of tobacco sheet which is essential if a high-speed wrapping machine is to operate without frequent interruptions.

It is an object of the present invention to provide an improved method and apparatus for continuously applying a helical wrapping on a rod-shaped object.



It is a further object of the invention to provide a method and apparatus for the continuous high-speed wrapping of cigar bunches aligned end to end, helically with a band of tobacco sheet from a roll thereof.

Another object of the invention is to provide a method and apparatus whereby cigar bunches are serially conveyed while rotated in a well-defined straight path free of any swaying movement.

These and other objects and advantages of the invention will be apparent from the description which follows.

In accordance with this invention, the cigar bunch can be of the conventional type with filler tobacco encased in a helically wound binder, but preferably the cigar bunch is made on a rod-making machine of the type used in cigarette manufacture where the filler is encased in a straight seam-pasted binder. In the latter case, the continuously formed rod is cut into cigar bunches of single or multiple length with a suitable cutoff device. In either case, the bunches are fed end-to-end through a low-friction rectilinear guide to two serially arranged and spaced sets of three driven rollers, the three rollers of each set being uniformly spaced around the axis of the cigar bunch and disposed with their three axes converging closely toward but not intersecting the axis of the cigar bunch so that the peripheries of the rollers contact the surface of the cigar bunch to impart both rotational and translational motion to the bunch, while a continuous ribbon of tobacco sheet is fed from a roll thereof into angular contact with the surface of the moving cigar bunch whereupon the ribbon is continuously helically wound around the cigar bunch by the helical movement of the bunch through the rollers. Prior to contacting the cigar bunch, the ribbon of tobacco sheet receives paste on its underside, as by conducting the ribbon over an appropriate paster, in order to adhere the ribbon to the bunch and thus prevent unraveling of the wrapped bunch after it leaves the rollers. As each helically wrapped bunch is pushed beyond the second set of driven rollers, a device severs the ribbon wrapped on that bunch at the point where the ribbon links that bunch to the next trailing bunch, which is in end-to-end relation to the wrapped bunch, in order to detach that wrapped bunch from the trailing bunch, preferably while the trailing bunch is still passing through the second set of rollers.

For a better understanding of the invention, reference is now made to the accompanying drawings which illustrate a preferred embodiment and of which:

FIGURE 1 is a lateral aligned sectional view (partially broken away for clarity), taken along the line 1—1 of FIGURE 2, of a machine which serially conveys rod-shaped objects such as cigar bunches while simultaneously rotating each such object about its axis as it longitudinally passes through the machine; and

FIGURE 2 is the end view of said machine when looking at its discharge end.

The machine comprises a tripodal frame **10** having three legs or arms **11, 12, 13** branching from cylindrical base **14** equidistantly, i.e., 120°, from each other around cylindrical base **14**. Frame **10** is supported with its cylindrical base **14** in a horizontal position by a vertical stand such as steel plate **15** to which frame **10** is fastened by bolts **16**. Base **14** has a central bore **17** aligned with circular aperture **18** in plate **15** and a rigid plastic tube **19**, preferably of nylon or Teflon, acts as liner of aperture **18** and bore **17** and as guide for the rod-shaped objects supplied to the machine.

An annular member **20** comprising drive pulley **21** and bevel gear **22** is rotatably mounted with two sets of ball bearings **23, 24** on the exterior surface **25** of cylindrical base **14**. Spacer ring **26** fixes the spacing between ball bearings **23, 24** and spacer ring **27** holds the assembly

of ball bearings 23, 24 and spacer ring 26 snugly in position against shoulder 28 on the exterior of base 14. Timing belt 29 on drive pulley 21 is driven by means of a suitable power transmission by an electric motor or the drive of a rod-making machine of the type commonly used to manufacture cigarettes. In the case of cigar bunches made with a cigarette-making machine, it is preferred to drive timing belt 29 from the drive of the cigarette-making machine because with the aid of a suitable power transmission the operation of the machine of this invention can be made to synchronize perfectly with the operation of the cigarette-making machine regardless of variations in the speed of the latter.

Each of arms 11, 12, 13 supports one roller of each of two serially spaced sets of three rollers. The first set of rollers 30A, 30B, 30C are attached to rotatable shafts 31A, 31B, 31C, respectively, which are mounted on arms 11, 12, 13, respectively. Likewise, the second set of rollers 32A, 32B, 32C are attached to rotatable shafts 33A, 33B, 33C, respectively, which are mounted on arms 11, 12, 13, respectively. Sleeve 34A passes through arm 11 and is held in position by set-screw 35A. Brass bearings 36A, 37A are inserted into the opposite ends of sleeve 34A. Shaft 31A passes through bearings 36A, 37A and has gear 38A attached to its end opposite the end with roller 30A. Retainer collar 39A holds washers 40A against bearing 36A while washer 41A is disposed between bearing 37A and gear 38A. Each of roller 30A, gear 38A and collar 39A is adjustably positioned along shaft 31A by a set-screw. The other two rollers 30B, 30C of the first set also have the same elements corresponding to those described in association with roller 30A and shaft 31A.

Sleeve 42A passes through arm 11 and is held in position by set-screw 43A. Brass bearings 44A, 45A are inserted into the opposite ends of sleeve 42A. Shaft 33A passes through bearings 44A, 45A and has gear 46A attached to its end opposite the end with roller 32A. Retainer collar 47A holds washer 48A against bearing 44A while washer 49A is disposed between bearing 45A and gear 46A. Each of roller 32A, gear 46A and collar 47A is adjustably positioned along shaft 33A by a set-screw. The other two rollers 32B, 32C of the second set also have the same elements corresponding to those described in association with roller 32A and shaft 33A.

The pairs of gears 38A, 46A on arm 11, 38B, 46B on arm 12 and 38C, 46C on arm 13 are each meshed with gears 50, 51, 52, respectively, which form combination gears with bevel gears 53, 54, 55, respectively. Combination gear 52, 55 is rotatably mounted with two sets of ball bearings 56C, 57C on bolt 58C extending through arm 13. Spacer ring 59C fixes the spacing between ball bearings 56C, 57C and spacer ring 60C keeps combination gear 52, 55 from rubbing the surface of arm 13. Nut 61C on bolt 58C completes the assembly which permits bevel gear 55 to mesh with bevel gear 22 of annular member 20. In like manner, combination gears 50, 53 and 51, 54 also have the same elements corresponding to those described in association with combination gear 52, 55 so that all three bevel gears 53, 54, 55 mesh with bevel gear 22.

Thus, the machine just described will function to rotate the two sets of rollers 30A, 30B, 30C and 32A, 32B, 32C at the same speed by the operation of timing belt 29. As seen in FIGURE 2, the counterclockwise movement of belt 29 around pulley 21 (shown in FIGURE 1) causes bevel gear 22 to rotate counter-clockwise which in turn causes meshing bevel gears 53, 54, 55 to rotate clockwise. This clockwise rotation of bevel gears 53, 54, 55 acting through their combined gears 50, 51, 52, respectively, imparts counterclockwise rotation to gears 38A, 46A, 38B, 46B, 38C, 46C and respectively associated rollers 30A, 32A, 30B, 32B, 30C, 32C. Clearly, each of the two sets of rollers 30A, 30B, 30C and 32A, 32B, 32C rotating counterclockwise will cause clockwise rotation of a rod-shaped object which comes into contact first with all three rollers 30A, 30B, 30C and then with all three rollers 32A, 32B, 32C.

In a very important use of the machine just described, cylindrical cigar bunches aligned in end-to-end relation and pushed into contact with the first set of three rollers 30A, 30B, 30C will, when timing belt 29 is running simultaneously effect clockwise rotation (viewed in FIGURE 2) and longitudinal movement (to the right, viewed in FIGURE 1) of each cigar bunch contacting first the set of rollers 30A, 30B, 30C and then the set of rollers 32A, 32B, 32C. To ensure this helical advancement of the cigar bunches through the machine, it is desirable that each cigar bunch be at least slightly longer than the distance between the point where the first set of rollers 30A, 30B, 30C contact the cigar bunches and the point where the second set of rollers 32A, 32B, 32C contact the cigar bunches. In this way, each cigar bunch is under the positive action and control of at least one of the two sets of rollers during the passage of that cigar bunch through the machine.

In this illustrative important use of the machine, each cigar bunch is helically wrapped with a ribbon of tobacco sheet. As shown in FIGURE 2, the tobacco sheet ribbon R is drawn from a spool (not shown) around an idler roller 62, which may be supported by steel plate 15, and over a paste applicator 63 which functions to spread a paste such as aqueous methylcellulose or gum tragacanth on the bottom or inner side of ribbon R. As shown in FIGURE 1, ribbon R comes into contact with the top of each cigar bunch between the first set of rollers 30A, 30B, 30C and the second set of rollers 32A, 32B, 32C. The positive helical movement of the cigar bunches imparted by the two sets of rollers continuously pulls ribbon R from the spool, around idler roller 62 and over paste applicator 63 and helically wraps it around the cigar bunches as they pass through the second set of rollers 32A, 32B, 32C. The paste on the bottom or inner side of ribbon R sticks ribbon R on the cigar bunches so that it will not unravel after the cigar bunches leave the machine.

Paste applicator 63 may take any desired form. As shown in FIGURE 2, it is a hollow cylinder in form with a series of perforations or a narrow slit in the portion of its surface over which ribbon R is drawn. The paste is supplied to applicator 63 through flexible tubing 64 and a suitable bracket 65 for applicator 63 may also be mounted on plate 15. It is well to note that idler roller 62 and paste applicator 63 are both positioned angularly with respect to the length of the cigar bunches since ribbon R must come in angularly to the cigar bunches for proper helical wrapping thereon.

Inasmuch as tobacco sheet ribbon R is a continuous ribbon, the helically wrapped cigar bunches discharged by the second set of rollers 32A, 32B, 32C are linked to one another by ribbon R. A suitable severing device such as the type commonly used on cigarette-making machines to cut the continuous cigarette rod into individual cigarettes may be employed to cut through the helically wrapped ribbon R on the cigar bunches at every point where one cigar bunch abuts the next bunch. Thus, as the series of helically wrapped bunches moves (to the right, viewed in FIGURE 1), the severing device will cut through ribbon R each time two abutted ends of cigar bunches pass the severing device. Such abutted ends of cigar bunches linked by the helical wrapping of ribbon R is shown in FIGURE 1 at point A in the series of bunches. With each cut made by the severing device at point A between linked bunches, another helically wrapped cigar bunch has been completed and detached from the trailing series of bunches.

FIGURE 1 also shows at points B the abutted ends of cigar bunches before they have been covered with the helical wrapping of ribbon R. Cigar bunches made on a conventional cigarette-making machine will have the pasted longitudinal seam of the enveloping tobacco sheet

along the top of the bunches and therefore this top seam is not seen in the bunches entering the machine of the invention as viewed in FIGURE 1. However, as soon as a cigar bunch is pushed into contact with the first set of three rollers **30A, 30B, 30C** it begins to rotate about its axis while simultaneously moving longitudinally so that seam S of the bunch which is under the positive action of rollers **30A, 30B, 30C** as well as of rollers **32A, 32B, 32C** may be seen in FIGURE 1. It is well to note that the distance between the first and second sets of rollers is less than the length of each cigar bunch which is acted upon by these two sets of rollers. In this way, each bunch is continuously under the positive control of at least one of the two sets of rollers from the moment when the bunch enters the first set of rollers **30A, 30B, 30C** to the moment when that bunch leaves the second set of rollers **32A, 32B, 32C.**

Customarily, the wrapper on a cigar is helically applied with a helix angle in the range of about 40° to 50°. To achieve such helical wrapping of cigar bunches with the machine of this invention, each of the three arms **11, 12, 13** of tripodal frame **10** is also at an angle in the range of about 40° to 50° with respect to the axis of cylindrical base **14** of frame **10.** Because shafts **31A, 31B, 31C, 33A, 33B, 33C** are set at right angles to arms **11, 12, 13,** it is evident that rollers **30A, 30B, 30C, 32A, 32B, 32C** will also be disposed at the same angle of arms **11, 12, 13** relative to the axis of the series of cigar bunches.

In a specific example of the machine shown in the drawings, double cigar bunches 9⅛ inches in length and $^{27}/_{64}$ inch in diameter produced on a cigarette-making machine with a tobacco sheet of the type disclosed in U.S. Patent 2,592,553 to W. G. Frankenburg and P. W. Garbo in lieu of cigarette paper are continuously fed in abutted end-to-end relation into plastic tube **19** and as each double cigar bunch comes into contact with the first set of three rollers **30A, 30B, 30C** it is positively advanced by these rollers with a simultaneous forward and rotational movement. Each advancing double cigar bunch also comes into contact with the second set of three rollers **32A, 32B, 32C** which not only stabilizes the action of the first set of rollers **30A, 30B, 30C** on that bunch but also positively continues the advancement of that bunch after it leaves the first set of rollers. The distance between the point of contact of the first set of rollers and the point of contact of the second set of rollers is 4½ inches along the length of the cigar bunch. The three arms **11, 12, 13** supporting the rollers radiate from cylindrical base **14** equidistantly from each other and at an angle of 40° to the axis of cylindrical base **14.** Since rotatable shafts **31A, 31B, 31C, 33A, 33B, 33C** are mounted at right angles to their respective supporting arms **11, 12, 13,** rollers **30A, 30B, 30C, 32A, 32B, 32C** attached to these rotatable shafts are also disposed at an angle of 40° to the axis of the cigar bunches acted on by the rollers. The angular or oblique position of the rollers in turn controls the helix angle of the helical movement of the cigar bunches through the two sets of rollers.

In this specific example, a ribbon, $1^{5}/_{16}$ inches wide, of tobacco sheet of the type disclosed in U.S. Patent 3,076,729 to P. W. Garbo is drawn from a roll thereof rotatably held by a bracket of the type provided with a brake which is released in response to a pulling action on the ribbon as shown in FIGURE 1 of U.S. Patent 3,060,775 to J. A. Dreher. Then the ribbon passes over paste applicator **63** which spreads a thin layer of aqueous methylcellulose paste on the bottom or inner surface of the ribbon and thence the ribbon is further drawn between the two sets of rollers by the helical movement of the double cigar bunches on which the ribbon is wrapped. With the rollers disposed at an angle of 40° to the axis of the cigar bunches, the helix angle at which the ribbon of tobacco sheet is wrapped on the cigar bunches is also 40° and it is at this same acute angle that the ribbon comes into tangential contact with the cigar bunches after it receives paste from applicator **63.** The selected width of ribbon for the cigar bunch diameter used in this example gives an overlap of about $^{5}/_{16}$ inch width at the successive convolutions of the helically wrapped ribbon. The helical wrapping of the ribbon is carried out at a speed of 250 double cigar bunches per minute. Inasmuch as the wrapped double bunches are then cut into individual cigars, the wrapping speed of the machine in this specific case is equivalent to 500 cigars per minute.

While the machine of this invention has been described in terms of a very important commercial use thereof, it is obviously not limited to the production of cigars. The helical movement of cylindrical objects may be required in applying a protective sheet and coating to metal tubes and rods. Furthermore, the machine may be used merely to apply a decorative helical stripe to the surface of cylindrical objects. Such a decorative stripe may be applied by painting, burning, etching, grinding and similar techniques on the surface of cylindrical objects depending on their composition and the decorative effect desired.

It will be evident to those skilled in the art that many variations and modifications of the invention may be made without departing from its spirit and scope. For instance, while the machine of this invention has been described in its preferred simple form with three arms supporting two tandem sets of driven rollers, the machine may have four arms uniformly spaced from each other, in which case each of the two tandem sets will have four driven rollers to make simultaneous contact with the cylindrical surface of the rod-shaped objects undergoing helical movement. Likewise, whether the machine has three or more arms, each arm may support three driven rollers rather than just two as previously described so that the machine will then have three sets of driven rollers in tandem alignment. Such modifications would increase the cost of the machine and, in most cases, would not be justified.

What is claimed is:

**1.** A machine for the helical movement of cylindrical objects arranged longitudinally in series, comprising elongated guiding means into which said objects are introduced longitudinally, and at least two tandem aligned sets of at least three driven rollers uniformly spaced around the axis of said objects adjacent the discharge end of said guiding means and disposed near the free ends of rotatable shafts extending from a fixed support closely toward the axis of said objects so that the peripheries of said rollers contact the cylindrical surface of said objects to impart both rotational and translational motion to said objects, said rotatable shafts being driven at the same speed and in the same rotational direction.

**2.** The machine of claim **1** wherein the tandem aligned sets of rollers are spaced from each other a distance less than the length of each cylindrical object measured along said length from the point of contact of one set of rollers to the point of contact of the next set of rollers with the cylindrical surface of said object.

**3.** The machine of claim **1** wherein the rotatable shafts for each of the tandem aligned sets of rollers are driven by a gear train powered by a single drive through which the elongated guiding means extends.

**4.** The machine of claim **1** wherein each of the rotatable shafts of the rollers of the tandem aligned sets of said rollers is disposed with its axis at an angle in the range of about 40° to 50° relative to the axis of the cylindrical objects contacted by said rollers.

**5.** In a cigar bunch machine of the type used to make cigarettes, the improvement of the combination therewith of means for helically wrapping a ribbon of tobacco sheet on the cigar bunches issuing longitudinally in series from said machine which comprises an elongated guide through which said bunches pass in series to at least two tandem aligned sets of at least three driven rollers uniformly spaced around the axis of said bunches adjacent the discharge end of said guide and disposed near the free

ends of rotatable shafts extending from a fixed support closely toward the axis of said bunches so that the peripheries of said rollers contact the cylindrical surface of said bunches to impart both rotational and translational motion to said bunches, said rotatable shafts being driven at the same speed and in the same rotational direction, and means for supplying said ribbon obliquely relative to the axis of said bunches between two of said sets of rollers so that said ribbon is helically wrapped on said bunches undergoing both said rotational and said translational motion.

**6.** The improvement of the machine of claim **5** wherein a paste applicator is positioned to spread paste on the inner side of the ribbon of tobacco sheet before said ribbon is helically wrapped and adhesively fastened on the cigar bunches undergoing both rotational and translational motion.

**7.** The improvement of the machine of claim **6** wherein the tandem aligned sets of rollers comprise a first set of rollers and a second set of rollers spaced from each other a distance less than the length of each cigar bunch measured along said length from the point of contact of said first set of rollers to the point of contact of said second set of rollers with the cylindrical surface of said bunch.

**8.** The improvement of the machine of claim **5** wherein the tandem aligned sets of rollers are driven by a gear train powered by the drive of said machine and each of the rotatable shafts of said rollers is disposed with its axis at an angle in the range of about 40° to 50° relative to the axis of the cigar bunches contacted by said rollers.

**9.** A machine for the helical movement of cylindrical objects arranged longitudinally in series, comprising a tripodal frame having a horizontal cylindrical base and three arms extending therefrom at a uniform oblique angle to the axis of said base and spaced equally from each other around said base, an axial passage through said base to permit said objects to pass longitudinally therethrough, two spaced rotatable shafts extending from each of said arms closely toward the axis of said base, a roller mounted near the free end of each of said rotatable shafts so that the periphery of each said roller will contact the cylindrical surface of said objects as they leave said axial passage, and means for driving each of said rotatable shafts at the same speed and in the same rotational direction.

**10.** The machine of claim **9** wherein the oblique angle is in the range of about 40° to 50°.

**11.** The machine of claim **10** wherein the means for driving each of the rotatable shafts is a gear train associated with a drive pulley rotatably mounted around the cylindrical base of the tripodal frame.

**12.** A machine for the helical movement of cylindrical objects arranged longitudinally in series, comprising elongated guiding means into which said objects are introduced longitudinally, and a cylindrical base through which said guiding means extends and from which three arms branch out equidistantly from each other and equally inclined relative to the axis of said objects discharging from said guiding means, each of said arms supporting a first rotatable shaft with a roller mounted thereon and a second rotatable shaft with a roller mounted thereon, all said shafts converging closely toward the axis of said objects so that the peripheries of all said rollers contact the cylindrical surface of said objects beyond the discharge end of said guiding means and all said shafts being rotatable at the same speed and in the same rotational direction by a gear train powered by a single drive, whereby the contact of the peripheries of said rollers with the cylindrical surface of said objects imparts both rotational and translational motion to said objects.



**13.** The method of helically wrapping a ribbon on cylindrical objects which comprises bringing said objects arranged longitudinally in series into simultaneous contact with three rotating rollers uniformly spaced around the axis of said objects and disposed with their axes at an acute angle to the axis of said objects, supplying said ribbon obliquely to the axis of said objects so that said ribbon is helically wrapped on said objects after their contact with said three rollers, making simultaneous contact of the helically wrapped objects with another three rotating rollers uniformly spaced around the axis of said helically wrapped objects and disposed with their axes at an acute angle to the axis of said helically wrapped objects, and rotating all of said rollers at the same speed and in the same rotational direction.

**14.** The method of claim **13** wherein a paste is applied to the inner side of the ribbon before said ribbon is helically wrapped on the cylindrical objects.

**15.** The method of claim **14** wherein the cylindrical objects are cigar bunches made on a machine of the cigarette-making type, and the ribbon is a tobacco sheet supplied obliquely at an angle in the range of about 40° to 50° to the axis of said bunches.

**16.** The method of claim **5** wherein the width of the ribbon of tobacco sheet is selected relative to the diameter of the cigar bunches to provide an overlap of the helically wrapped ribbon on said bunches.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 590,629 | 9/1897 | Richards | 131—59 |
| 1,054,961 | 3/1913 | Dean | 93—80 |
| 2,489,503 | 11/1949 | Sampson et al. | 93—80 X |
| 3,058,474 | 10/1962 | Banning | 131—59 |



HUGH R. CHAMBLEE, Primary Examiner

U.S. Cl. X.R.

93—80; 131—59

# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,467,108 Dated September 16, 1969

Inventor(s) Bert H. Wallace

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 26, "washers" should read --washer--.
Column 4, line 6, "running" should read --running, --.
Column 8, line 40, "claim 5" should read --claim 15--.

SIGNED AND
SEALED
AUG 25 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

FORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334