Jan. 23, 1968 P. DIEFFENBACH 3,365,529

ARTIFICIAL TREE LIMB TAPERING METHOD

Filed Aug. 3, 1966 2 Sheets-Sheet 1

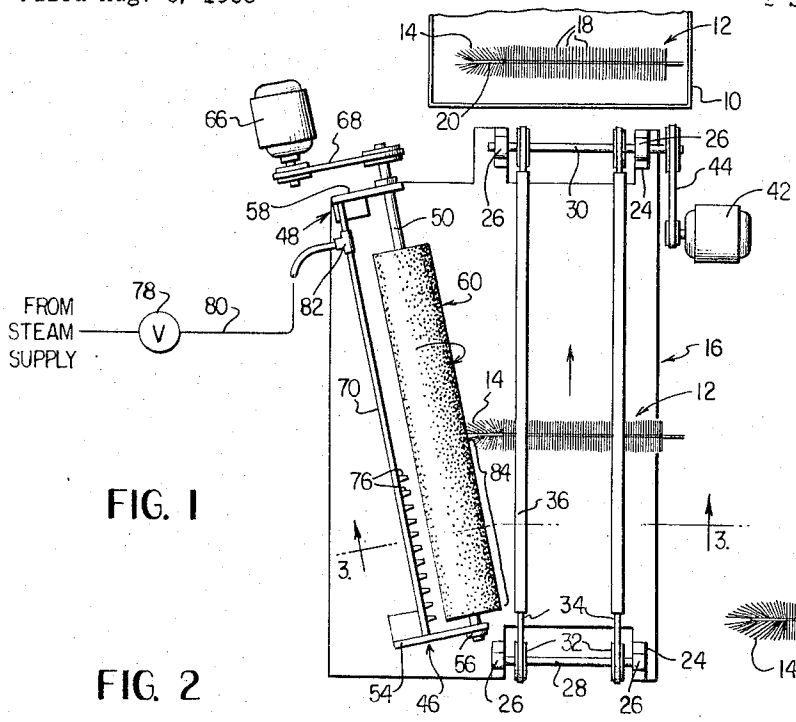


FIG. 1

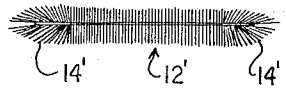
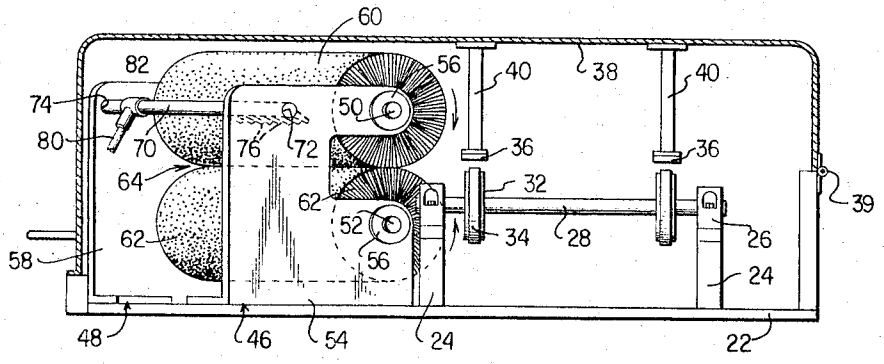


FIG. 4

FIG. 2



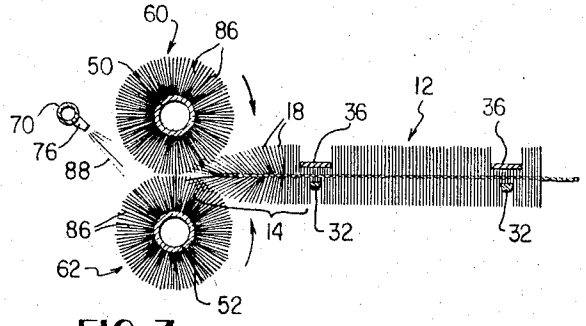


FIG. 3

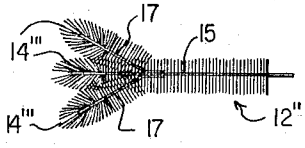


FIG. 5

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ARTIFICIAL TREE LIMB TAPERING METHOD

Filed Aug. 3, 1966 2 Sheets-Sheet 2

FIG.10

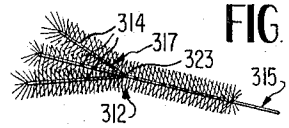


FIG.6

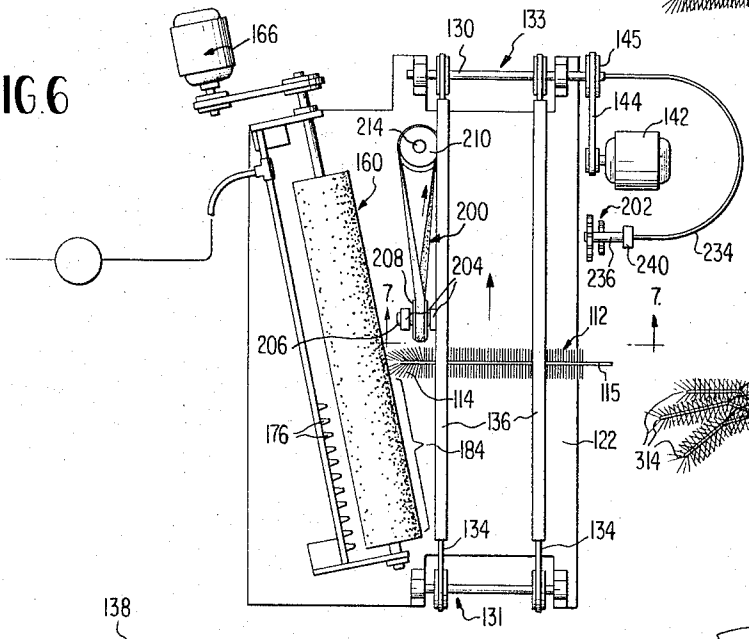


FIG.11

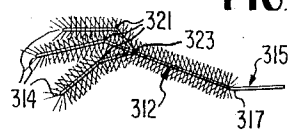


FIG.7

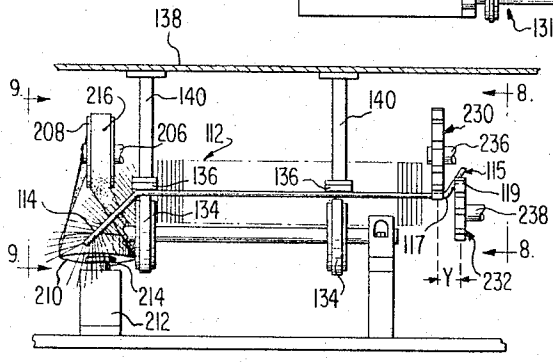


FIG.8

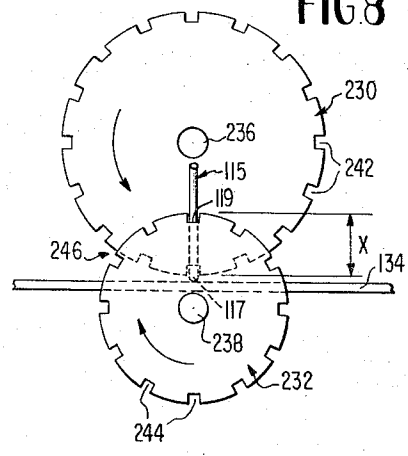
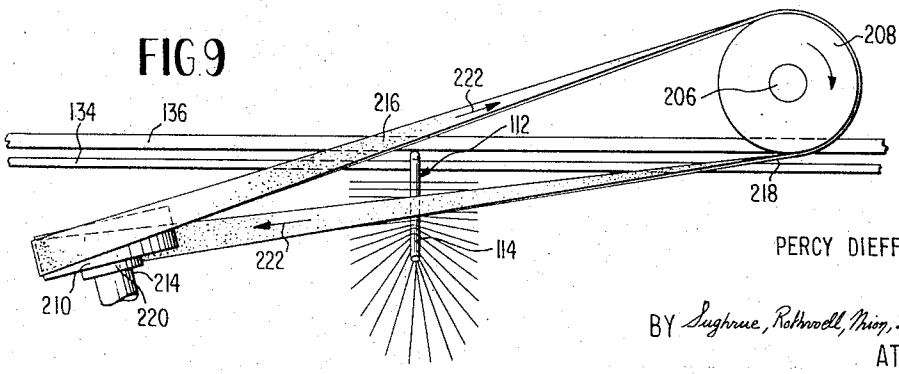


FIG.9



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ARTIFICIAL TREE LIMB TAPERING METHOD

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Continuation-in-part of application Ser. No. 504,578, Oct. 24, 1965. This application Aug. 3, 1966, Ser. No. 573,752

3 Claims. (Cl. 264—322)

ABSTRACT OF THE DISCLOSURE

Method of tapering plastic filaments in Christmas tree limbs by heating the tip end with a fluid and forcing the filament into an inclined position followed by cooling.

This invention relates to a method for tapering the tip end of artificial Christmas tree limbs or the like, and more particularly, to fully automated means to provide the proper taper to the limb tip without matting the needles carried thereon. This invention further relates to automatic means for providing to a tapered or untapered limb assembly the proper bend at the tip and/or trunk inserting end with minimum matting to the needles carried thereby.

This application is a continuation-in-part of my application Ser. No. 504,578 filed Oct. 24, 1965 now abandoned.

In the past several years, there have come into vogue artificial Christmas tree designs involving the use of multiple tree limbs carried by a central tree trunk. The limbs may consist of main limb sections and cross-limbs carried thereby which are formed of a pair of twisted wires capturing precut, plastic filaments which, to a degree, simulate the needles of the natural tree. The limbs are formed from what is known in the industry as "brush stock" in which the captured filaments are of equal length and centrally positioned so that the ends of the filaments fan out in radial fashion at right angles to the axis of the limb. The "brush stock" is made in continuous fashion by feeding bristles between a pair of endless wires prior to twisting with brush stock being cut into appropriate lengths for the limbs subsequent to twisting.

The brush stock is thus provided with a cylindrical configuration of unvarying diameter. In a natural evergreen tree, the new needles at the tip of the limb are, of course, much shorter than the mature needles interiorly of the branch or limb tip. Thus, nature provides limbs having a tip configuration in the form of a rounded or tapered cone.

In order to provide an artificial Christmas tree having the greatest aesthetic appeal to the purchasing public, it has been found desirable to taper each tip of the Christmas tree limb to provide a product closely simulating an actual tree. Since the plastic needles, such as those formed of polyvinyl chloride, have excellent elastic memory, merely mechanically deforming the filaments at the tip by bending them over from the radial position to an in-line position with the twisted wires, provides only momentary tapering. However, by subjecting them to increased temperature of a level sufficient to impair their elastic memory, they will tend to remain in a deformed position, and upon subsequent cooling, the elastic memory of the needles will allow them to remain in their inclined or in-line position effecting a true taper to the tip of the artificial tree limb.

While it is well known to heat plastic to momentarily alter the elastic memory of the plastic material and while it is well known to deform the material in the heated condition, the problem with "brush stock" material is that all known conventional means for deforming a portion of the brush stock not only provides the desired deformation, but results in completely matting those needles about and in line with the twisted wire, instead of providing the desired gentle taper in which the equi-radius filaments are inclined to an increasing degree toward the extremity of the tip.

In order to increase the aesthetic appeal of the artificial Christmas trees of this type, the outer ends of a single tip or multiple tip branch assembly are conventionally bent upwardly in order to give maximum symmetry and style to the tree design. Further, especially in cases where the tree is composed of limb assemblies having cross-limb sections, it is necessary to bend the inner end of the limb assembly, that is the point that is the end which extends into the drilled trunk, in a downward direction since it is the position of the bend at the point intermediate of the cross-limb attachment and the end inserted within the three trunk, that prevents rotation of the limb assembly about the drilled hole axis, which would most surely occur since the presence of the cross-limb provides an imbalance to the multiple tip tree limb assembly.

It is, therefore, a primary object of this invention to provide a method for tapering the tip end of an artificial tree limb composed of precut, plastic filaments captured by a pair of twisted wires.

It is a further object of this invention to provide a completely automated method for heating the tip sections of the Christmas tree limbs as they are being fed in a direction normal to the limb axis and tapering the tip without matting the same, prior to the cooling of the tip section.

It is a further object of this invention to provide a method for tapering artificial Christmas tree limbs consisting of precut, plastic filaments captured by a pair of twisted wires which is applicable to limb components having tips at one end, tips at both ends, or complete limb subassemblies involving one or more cross-limbs carried by a main limb section, each having an in-line tip section.

It is, therefore, a further object of this invention to provide a completely automated method for bending the limb ends and/or tips at some angle, both for single or multiple tip limb assemblies as the limbs move in serial fashion through the apparatus.

It is a further object of this invention to provide an improved fully automated Christmas tree limb bending method in which the inner and tip ends of each limb assembly is uniformly bent without in any way matting the plastic filaments carried by the limb assembly.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a top plan view of the fully automated apparatus of the present invention in a preferred embodiment.

FIGURE 2 is a front elevational view of the apparatus shown in FIGURE 1 including a hood tending to retain the steam in the working area.

FIGURE 3 is an elevational view of a portion of the apparatus taken along lines 3—3 of FIGURE 1 showing an artificial tree limb having one tip section in taper receiving position.

FIGURE 4 is a plan view of an artificial Christmas tree limb having a pair of opposed tip sections tapered in the manner of the subject invention.

FIGURE 5 is a plan view of an artificial Christmas tree limb assembly including a main limb section and a pair of diagonally directed cross-limbs after the tips have been tapered by the method of the present invention.

FIGURE 6 is a top plan view of a second embodiment of the fully automated apparatus of the present invention including means for bending the tip and inner end portions of a tapered Christmas tree limb.

FIGURE 7 is a front elevational view of a portion of the apparatus shown in FIGURE 6, with a tree limb being bent at both ends.

FIGURE 8 is a side elevational view of a portion of the apparatus shown in FIGURE 7 taken about lines 8—8.

FIGURE 9 is a side elevational view of the apparatus shown in FIGURE 7, taken about line 9—9.

FIGURE 10 is a perspective view of a multiple tip artificial Christmas tree limb prior to bending the tip and inner end sections at some angle to the main limb axis.

FIGURE 11 is a perspective view of the same limb assembly, after passing through the limb bending section of the apparatus shown in FIGURES 6 through 9 inclusive.

In general, the present invention is directed to a method of tapering the outer end or tip of an artificial Christmas trees limb formed of a plurality of constant length, precut, plastic filaments captured by a pair of twisted wires with the filament ends projecting radially of said limb and at right angles to the limb axis, said method comprising moving a series of spaced limbs while raising the temperature of the filaments of the tip section to reduce their elastic memory, forcing the heated filaments away from their right angle, radial position to an increasing inclined position in a direction toward the tip extremity, and cooling of the heated, inclined filaments.

In a preferred form, the apparatus of the present invention consists of conveyor means for moving spaced limbs, in sequential fashion, in a direction normal to the limb axis. The tips of the limb pass through the nip of a pair of cylindrical roller-type brushes which are driven in opposite directions tending to brush the filaments outwardly from their right angle position to positions in line with the limb axis, while subjecting the filaments carried by the tip section to steam issuing from a series of jets positioned adjacent the brush nip area. The oppositely driven, roller-type brushes have their in-line axes inclined away from the direction of brush movement so that the outermost filaments of the tip section are in contact with the driven roller-type brushes for the longest period of time and are thus inclined to a greater extent than the innermost filaments of the same tip section. The tip section is thus provided with a gentle taper without attendant matting.

In a preferred form, after the limb passes from the nip of the cylindrical roller-type brushes, the conveyor means continues to feed the limbs in serial fashion through a bending section of the apparatus wherein a twisted endless belt which is frictionally driven by the moving limbs themselves cause the tapered tip section or sections of the limb assembly to be bent at some angle relative to the longitudinal axis of the main section of the limb. Simultaneously, opposed, spaced notched wheels engage the filament-free inner end of the limb assembly and bend it in a positive manner to effect an opposite bend to the inner end of each limb assembly.

Referring to the drawing, there is shown, in FIGURES 1 through 3, a preferred form of the present invention as applied to artificial Christmas tree limbs having one tip section only. At the upper end of FIGURE 1, there is shown a container or hopper **10** which acts to receive, in serial fashion, artificial Christmas tree limbs **12**, the tip section **14** of which has been tapered in a fully automatic manner by the machine or apparatus, indicated generally at **16**. Each limb **12** is formed of precut, plastic filaments simulating the needles of a coniferous natural tree. The filaments **18** are of equal length and are captured by a pair of twisted wires **20** and held centrally thereof. The act of twisting and capturing the wires tends to fan the filaments **18** radially of the twisted wires **20**, with the filaments extending generally at right angles to the axis of the limb. The method of producing the "brush stock" forming the basic material for my artificial Christmas tree design may be best seen in my copending application, Ser. No. 316,232, filed Oct. 15, 1963, entitled, "Apparatus for Making Brushes," now United States Patent No. 3,223,454. It is noted that the limb section **12** is characterized by having a tip section in which the needles, instead of extending radially at right angles to the axis of the limb, are inclined toward the extremity of the tip section at an increasing rate to effect the general taper which simulates, to the greatest degree, a natural tree limb.

The method of the present invention uses essentially a table **22** in the form of an irregular rectangle which may be supported by a number of table legs (not shown). Fixed to the table **22** in upstanding fashion are four spaced, vertical support members **24** which are provided with bearings **26**. The bearings support transverse shafts **28** and **30** at the front and rear of the table, respectively. Each shaft carries appropriate pulleys **32** which act to support endless chains or belts **34**, the top section of the endless belts being positioned slightly below a pair of fixed guide members **36** in the form of strips suspended from a cover or shroud member **38** by pendant support members **40**. The rear shaft **30** is suitably driven by an electric motor **42** through conventional pulley and belt means **44**. Thus, as long as the electric motor **42** is in operation, the endless belts **44**, which alternatively could be endless chains, tends to sandwich the spaced limb members **12** between the endless belts and the fixed strip guides **36**, whereby the limbs are moved frictionally from the forward end of the machine toward hopper **10** for discharge therein. Thus, the limbs are moved in in-line fashion in a direction normal to the axis of the limb with the tip section extending outwardly and to one side of the left-hand belt member **34**.

The second important component of the present invention resides in the method for effecting the desired taper to the tip section without matting the individual filaments as they are moved from a right angle radial position to positions increasingly inclined. In this respect, the table **22** is provided with a front L-shaped support bracket **46** and a rear L-shaped support bracket **48** which acts to support a pair of spaced, driven upper and lower shafts **50** and **52**, as best seen in FIGURE 2. The front bracket member **46** includes a vertical plate section **54** which is provided with suitable spaced apertures that receive the front ends of shafts **50** and **52**. The ends of the shaft carry washers **56** to prevent axial movement of the shaft but allow rotation about the shaft axis. The rear bracket member **58** is likewise provided with an upstanding plate member **58** which supports the shafts **50** and **52** in like manner. Each of the shafts **50** and **52** have coupled thereto elongated cylindrical brush type rollers **60** and **62**, respectively, which extend the greater distance of the table and are in contact with each other at the nip area **64**. A second drive motor **66** is supported (by means not shown) at the rear of the table and includes appropriate belt and pulley drive means **68** for rotating the upper brush **60** in a clockwise direction, as indicated in FIGURE 2 by the upper arrow. The cylindrical brush type rollers are in peripheral contact with each other allowing the lower brush assembly **62** to be driven in a counterclockwise direction by the frictional contact therebetween. However, positive drive means may be employed for rotating the lower cylindrical brush assembly **62** in a direction opposite to that of the upper brush assembly at the same speed. It is noted that the bracket members **46** and **48** are not in line with the direction of movement of the limb element **12**, as indicated by the straight arrow in FIGURE 1. Instead, the driven brush assembly is inclined outwardly away from the point of entry of the limb so that when the limb element **12** is positioned on

the conveyor means of the front end of the machine, the tip section 14 of the limb is received within the nip 64 of the rotating, cylindrical brush assembly, but as the limb moves rearwardly on the conveyor means, the tip section 14 gradually moves out of brush roller contact. In this respect, it is, therefore, apparent that the filaments carried by the extreme end of the tip section remain in contact with the rotating cylindrical brushes for a longer period of time than do the interior filaments of the same tip section.

The two bracket members 46 and 48 serve a second function in that they support the third important element to the tree limb tapering apparatus. A hollow pipe member 70 which comprises a closed tube is supported by apertures formed in both of the vertical plate members 54 and 58 spaced outwardly of the cylindrical brush assemblies. Plate 54 is provided with aperture 72 while plate 58 is provided with aperture 74 for receiving the ends of the hollow pipe or tube 70. The pipe is provided with a series of jet nozzles 76 at the forward end of the table, the nozzle 76 being directed downwardly at a slight angle so that the fluid is ejected into the nip 64 or line of contact between the cylindrical brush members 60 and 62. Steam, from a steam supply (not shown), passes through conduit 80 to a fluid coupling 82 carried by the longitudinally extending pipe 70, whereby steam is ejected through the individual, spaced nozzles 76 to the area of contact between the rotating brush assemblies. Valve means 78 may be suitably employed to control the steam issuing from the nozzles. The steam acts to heat the tip sections 14 of the brush assemblies as they pass between the driven cylindrical roller-type brushes at the forward end of the machine, whereupon the heated filaments lose their elastic memory and are compressed by the brushing action of the roller-type brushes. If the axis of the brush assembly were in line with the direction of limb movement, all of the needles in contact with the brush members would be deformed equally; that is, they would all lie generally in line with the limb axis in a highly matted condition. Instead of providing a gentle taper, they would merely change the position of the filament-type needles from a radial position to an in-line position. By having the axis of the brush roller assembly at some slight angle away from the in-line position, those needles at the extreme outer end of the tip section are held within the nip of the brushes for a longer period of time and are thus inclined to a greater angle with respect to their previous right angle radial position. With the forward end 84 of the brush assembly being heated by the steam issuing from jet 76, the tip section 14 in passing into the nip area 64 has its filaments simultaneously pressed and heated. Almost instantaneously, the filaments are heated to the degree necessary for them to momentarily loose their elastic memory property. While they are not heated to any appreciably greater degree as they move out toward the position shown in FIGURE 1, the filaments themselves within the tip section remain compressed between the brush rollers to a lesser or greater degree and once they reach the position shown in FIGURE 1 and are cooled, they retain their inclined attitude to effect the soft taper indicated by the completed product within hopper 10.

Note further, in FIGURE 3, that the upper and lower roller-type brushes 60 and 62 are themselves formed of stiff radial fibers 86 which tend to brush out the needle filaments within limb tip section 14. Thus, the tip of Christmas tree limb 12 is actually brushed rather than being compressed and matted by hard surface rollers.

From FIGURE 3, it is also clearly evident how the brush assemblies are heated. The jet of steam 88 which issues from nozzles 76 carried by pipe 70 permeates the area of nip 64 between the brush fibers 86 to effectively heat the needle-like filaments 18 of the Christmas tree limb tip section 14. Pivotable cover or hood 38 tends to maintain steam in the working area, but may be rotated about hinge 39 to provide access for repairs, etc. The ends of the machine are open to allow feeding and discharge of a series of limbs to be tapered.

Reference to FIGURE 4 shows a branch or limb configuration 12' in which a pair of brush roller assemblies and steam heating means positioned at some angle on either side of the endless conveyor means act to simultaneously taper both ends to form dual tapered tip sections 14'. The apparatus performing this function is identical to that shown in FIGURES 1 through 3 with the exception that duplicate heating and brushing means are provided on each side of the endless conveyor means.

In FIGURE 5, an alternate form of Christmas tree limb 12'' is provided which incorporates, in addition to the main limb section 15, a pair of diagonally directed cross-limbs 17. The main limb section and the diagonal cross-limb sections 17 have tip sections 14''' lying in a common plane. All of the tip sections are tapered simultaneously by passing the limb assembly 12'' through the apparatus of FIGURE 1 in the same manner as the single section Christmas tree limb 12.

It is contemplated that certain changes may be made while still practicing the invention, such as employing means other than a pair of rotating brushes, positioned for rotation in the manner shown at some angle to the line of movement of the limb or steam jets acting to heat the limb at the point of contact with the rotating brushes. For instance, rather than steam, heated air or heated liquid, such as water, may be used which may issue from the same type of jet discharge system. It is possible that air jets, etc., could be substituted for the brushes, and by varying fluid velocity, the desired taper could be achieved.

Referring to FIGURES 6 through 9, there is shown an alternate embodiment of the present invention which involves, in addition to the fully automatic means for tapering the tip end of the series of artificial Christmas tree limbs passing through the apparatus, automatic means for creating desirable bends to both the tip and inner end sections of each of the series of limbs as they move through the automated apparatus. In this embodiment, table 122 of identical configuration to that shown in FIGURE 1 is provided with the same type of conveyor means in the form of endless chains or belts 134, the top section of the endless belt being positioned slightly below a pair of fixed guide members 136 which act to carry a series of multi-tip or single tip artificial Christmas tree limbs 112 from front to rear, in the direction of the arrow. The fixed guide members 136 are suspended from a cover or shroud member 138 by pendant support members 140. The rear shaft 130 carrying belts 134 is suitably driven by electric motor 140 in the identical manner of the previous embodiment. The endless belts acting in conjunction with strip members 136 tend to sandwich the spaced limb elements 112 therebetween, whereby the limbs are moved frictionally from the forward end of the machine 141 toward the discharge end 133. Thus, identically to the previous embodiment, the limbs are moved in serial fashion in a direction normal to the axis of the limb assembly with the tip section 114 extending away from the conveyor means on the outside of the left-hand belt member 134. In this embodiment, a cylindrical roller type brush assembly is positively driven by drive motor 166 with steam jets 176 acting to heat the forward end 184 of the roller-type brush assembly. As in the previous embodiment, the upper brush type roller 160 acts in conjunction with a lower brush type roller (not shown), to effect the desired taper to the tip end 114 of the Christmas tree limb 112.

In the present embodiment additional means are provided for effecting a desired opposite bend to tapered tip section 114 of limb 112, and the inner end 115 of the same limb. The manner in which this is achieved involves the use of endless belt means indicated generally at 200, positioned on the outside of left-hand belt 134. In addition, positively driven bending means 202 is provided on

the outside of the right-hand belt which operates on the filament-free section **115** of the tree limb.

A pair of belt pulley support members **204** depend from the upper shroud or cover **138** and act to support a horizontally extending shaft **206** which carries a first pulley member **208** for free rotation about a horizontal axis. Spaced rearwardly therefrom, and in line with pulley **208**, is a second pulley **210** which is supported for free rotation about a vertical axis by means of a generally vertical support member **212**, fixed to the top of table **122**. The vertical support member **212** carries shaft **214** which supports the pulley **210**, slightly inclined from the horizontal as indicated best in FIGURE 9. An endless belt member **216** rides upon the peripheral surface of the two spaced pulleys **210** and **208**. With the forward pulley **208** mounted for rotation about a horizontal axis and positioned above the endless belt, and with the rearwardly disposed pulley **210** being below the conveyor belt **134**, the belt is twisted and moves from a generally horizontal position at tangent point **220** with horizontally oriented, rearwardly disposed, pulley **210**. Thus, as the unbent limb **112** emerges from the tapering means of the apparatus, the tip section **114** moves into contact with the outer surface of the belt **216** in the vicinity of the tangential contact point **218**, where the belt leaves the clockwise rotating pulley **208** (FIGURE 9). Since the belt is moving downwardly and at the same time changing from a generally horizontal position to a vertical position, the tip end **114** of the tree limb must also bend downwardly as best indicated in FIGURE 7. As mentioned previously, it is the frictional coupling between the belt **134** and each tree limb **112** that causes the limb to move from the front **131** to the rear **133** of the apparatus as the drive belts **134** are being positively driven by drive motor **142**.

The contact between the moving tip section **114** and the outer surface of belt **216** actually causes the belt **216** to move in the direction indicated by arrow **222** (FIGURE 9). The conveyor belt moves at the same speed as the limb **112** since it is being moved thereby. This greatly reduces the tendency to mat any of the filaments in contact with the outer surface of the conveyor belt **216**. Likewise, since the belt is changing its orientation and is moving from a position above the plane of the conveyor means to a position below the plane of the conveyor means, the tip section must naturally bend downwardly in the manner indicated best in FIGURE 7.

Since it is necessary to bend the inner end section **115** of the same limb in the opposite direction to the bend given to the outer tip section **114**, means are provided at **202** on the opposite side of the apparatus for automatically achieving the same. The means **202** generally comprise upper and lower axially spaced, overlapped notched wheels or disks **230** and **232** respectively which are positively driven in opposite directions by suitable flexible cable drive means **234**. A vertical support member **240** acts to support both shafts **236** and **238** which carry respective notched disks **230**, **232** at a desired rate of speed and in the proper direction as indicated in FIGURE 8. The upper disk **230** rotates in a counterclockwise direction as seen in FIGURE 8, while the lower disk **232** rotates in a clockwise direction. The periphery of the upper disk at the bottom thereof is generally in line with the upper run of the conveyor belt **136**, which defines the plane of limb movement. The upper disk **230** is provided with a series of spaced notches **242**, the width and depth and spacing of which is coordinated with the diameter of the lower disk **232**, the number, spacing, width and depth of its notches **244**, and the speed of rotation of disk **232**. They are driven in opposite directions by the flexible drive means **234** with the speed controlled by conventional support and gear driving means **240**. In this respect, the flexible drive means **234** is coupled directly to driven pulley **145** associated with the driven conveyor belt **144**. Therefore, both of the disks **230** and **232** are positively driven in opposite directions at a speed which is coordinated to the velocity of the conveyor belt **134** as they frictionally carry the spaced limbs **112**.

The purpose of the upper disk **230** is merely to physically locate the inner end **115** of the limb assembly adjacent the bend point **117** while the bending is actually achieved by the smaller overlapped outer disk **232**. As the conveyor means moves the inner end of the limb **115** not carrying filaments into the nip area **246** between the slightly overlapped notched disks **230** and **232**, the inner end **115** of the limb at point **119** will enter one of the notches **244** carried by lower disk **232** tending to bend the inner end section **115** upwardly about bend point **117** just outside the notched area of contact with the larger upper disk **230**. At the point of maximum bend, as shown in FIGURE 8, the extent of the upward bend given to the inner tip section **115** of the twisted wire brush limb **112** is determined by the axial spacing indicated at "Y" (FIGURE 7) between the two notched disks **230** and **232**, as well as the extent of vertical overlap which is identified as the distance "X" (FIGURE 8).

Obviously, instead of bending the tip section **114** of the tree limb downwardly and the inner end upwardly as indicated in FIGURE 7, the belt assembly **200** and the counter-rotating disk assembly **202** may be positioned in a different fashion with respect to the plane of the conveyor belt so as to provide up or down bending for either the tip or inner end section and to more or less of a degree than shown in the illustrated embodiment. Further, while the embodiments of FIGURES 6 through 9, inclusive, shows the tree limb bending means associated in conjunction with a tree limb tip tapering means, it is obvious that each portion of the apparatus may be operated separately although, when operated simultaneously, the single apparatus greatly reduces the amount of manual labor necessary to produce artificial tree limb assemblies while providing maximum uniformity to the limb assemblies as they are being fed in serial fashion through the machine.

The manner in which the automated bending device changes the configuration for the limb assembly may be best seen by reference to FIGURES 10 and 11 which show, in perspective, a multiple tip artificial Christmas tree limb assembly prior to, and subsequent to, bending. The tree limb assembly **312** employs three tips **314** formed by wrapping a cross-limb member **317** about a main limb element. With the exception of the inner end **315**, the assembly is formed of twisted wires which capture filaments therebetween in conventional artificial Christmas tree limb fashion. As the Christmas tree limbs of this type move serially through the machine, they are bent to the configuration shown in FIGURE 11. The tip ends **314** are bent downwardly about bend points **321**, spaced slightly from wrap point **323**. The inner end **315** of the multiple tip limb assembly is bent upwardly about bending point **317**. The use of the terms "upwardly" and "downwardly" are, of course, relative, since in actual operation, the limb assembly **312** is inverted, when coupled to the tree trunk so that the tip sections **314** actually bend upwardly and the main limb section bends downwardly after it emerges from a drilled hole in the tree trunk.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of tapering the tip end, without matting, of artificial Christmas tree limbs comprising the steps of: supplying limbs formed of constant length, pre-cut, plastic filaments captured by a pair of twisted wires with the filaments normally projecting radially of the limb axis at right angles thereto, depositing a series of said limbs on a continuous conveyor and thereafter, while on said

conveyor, raising the temperature of only those filaments at the tip end of each limb by directing a heated fluid thereon, positively forcing the heated tip end filaments from their normal radial position to axially inclined positions in a direction toward the limb tip extremity, and cooling the tip end filaments while axially inclined to thermally set the same.

2. The method as claimed in claim 1 wherein the step of forcing the heated tip and filaments from their normal radial position to axially inclined positions comprises; brushing the heated tip end filaments in a direction toward the limb tip extremity.

3. The method as claimed in claim 1 wherein the step of raising the temperature of only those filaments at the tip end of each limb comprises steam heating the same.

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