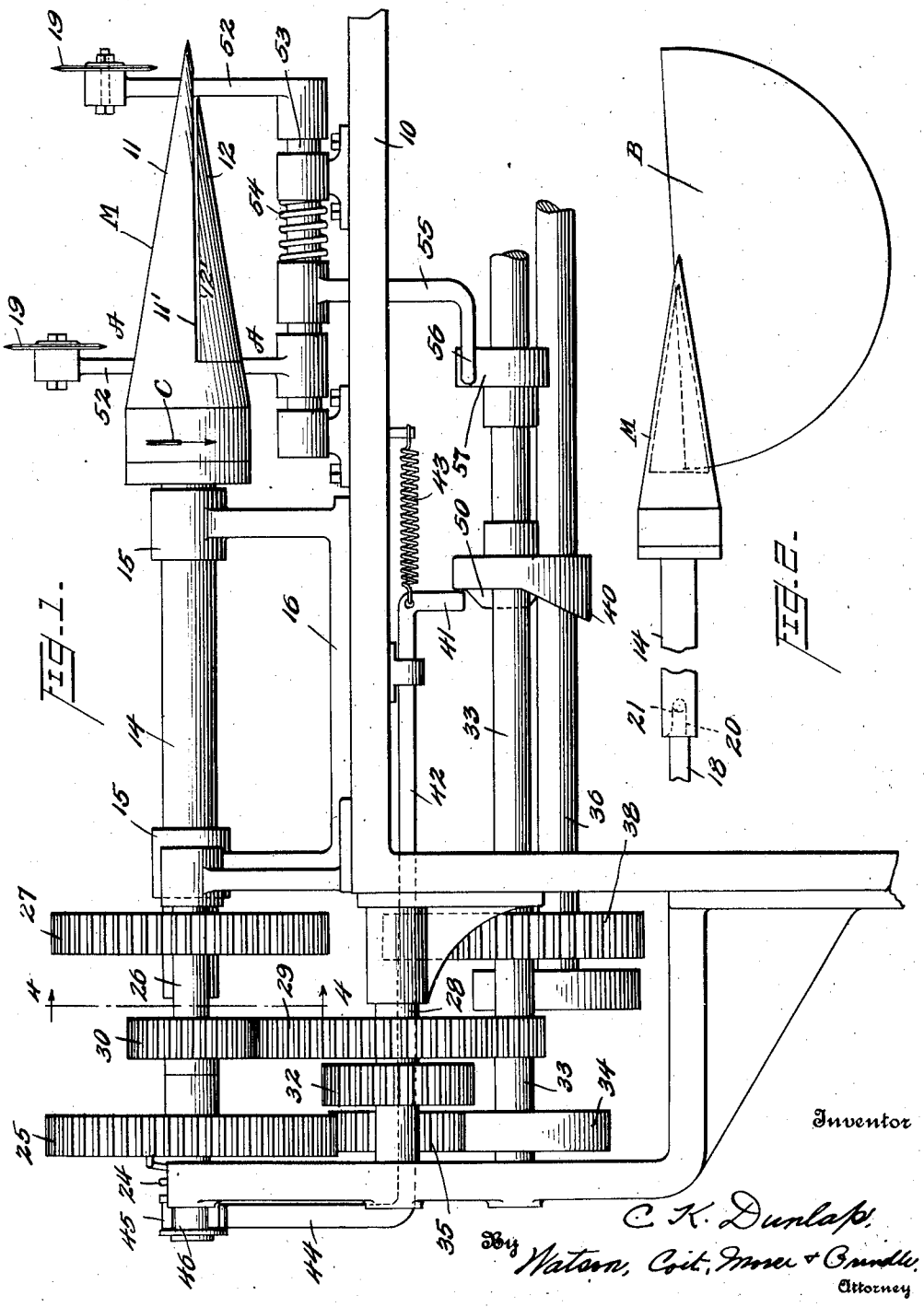
Oct. 30, 1928. 1,689,427

C. K. DUNLAP

MACHINE FOR MAKING PAPER CONES

Filed Nov. 1, 1926 3 Sheets-Sheet 1



Inventor

C. K. Dunlap.

By Watson, Coit, Grosvenor & Grindle.

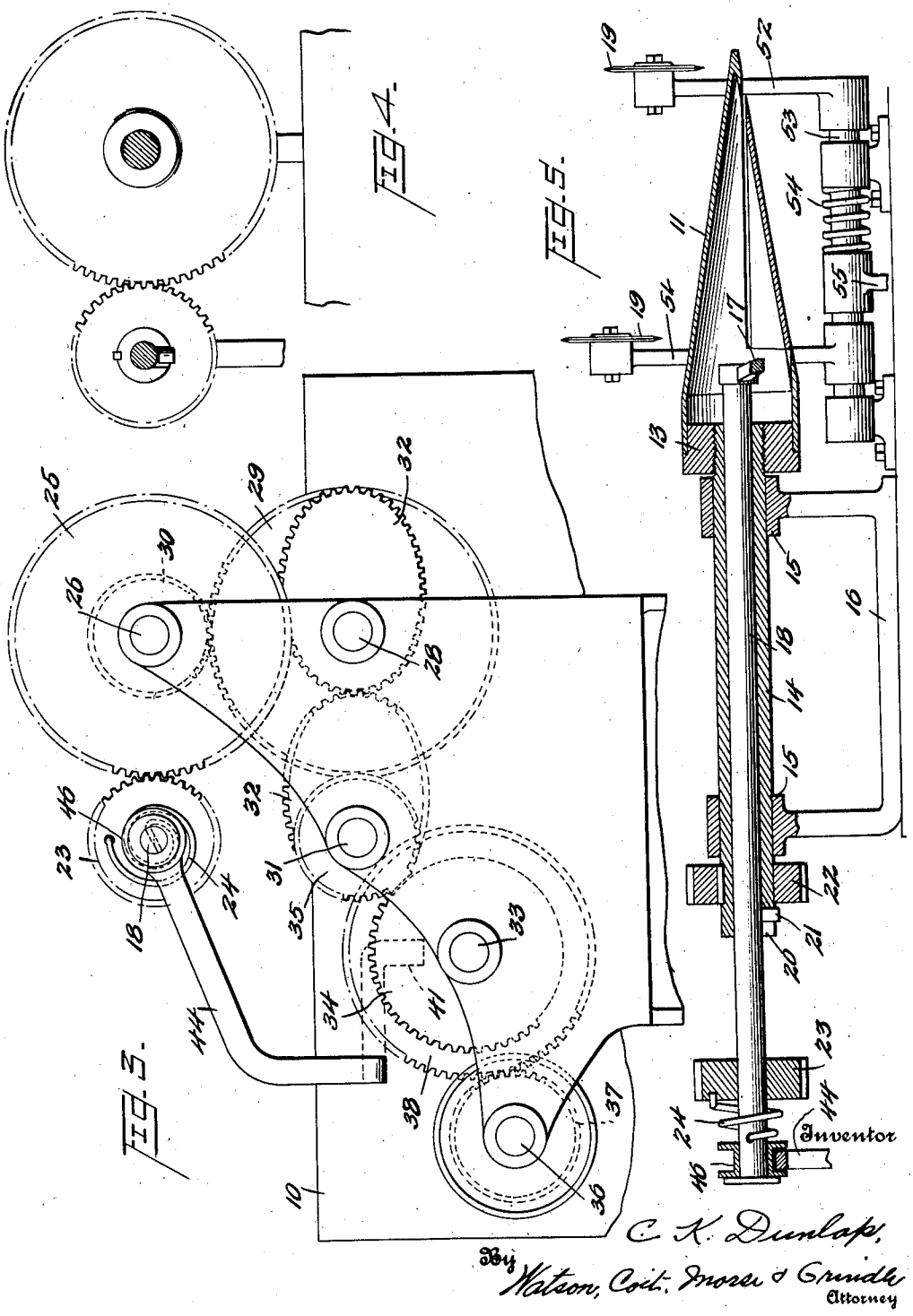
Attorney

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C. K. DUNLAP

MACHINE FOR MAKING PAPER CONES

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Oct. 30, 1928. 1,689,427

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MACHINE FOR MAKING PAPER CONES

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FIG. 6.

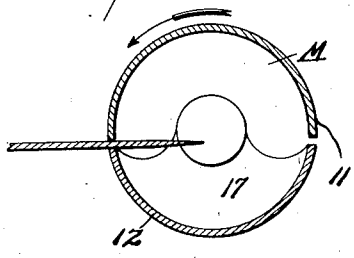


FIG. 7.

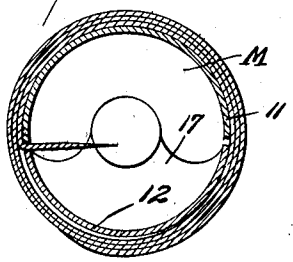


FIG. 8.

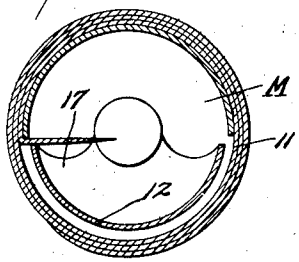


FIG. 9.

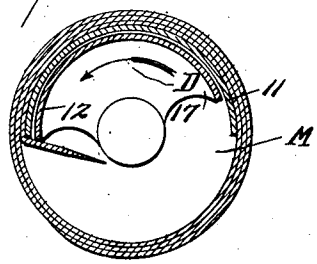


FIG. 10.

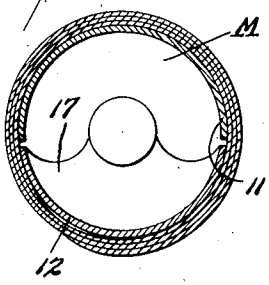


FIG. 11.

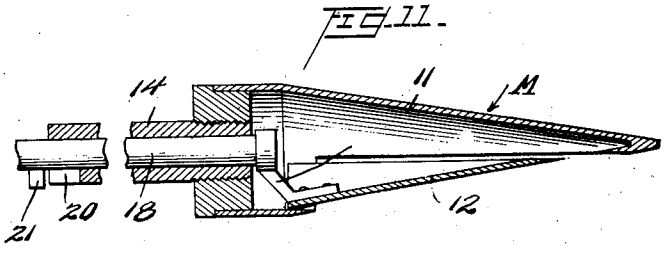
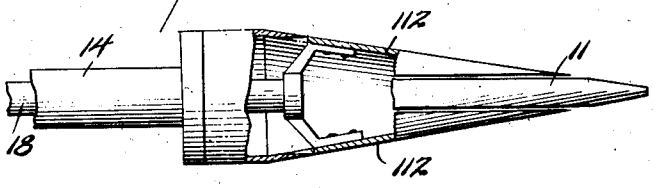


FIG. 12.



Inventor

C. K. Dunlap.

By Watson, Cole, Grindle & Grindle.

Attorney

Patented Oct. 30, 1928. 1,689,427

UNITED STATES PATENT OFFICE.

CHARLES K. DUNLAP, OF HARTSVILLE, SOUTH CAROLINA, ASSIGNOR TO SONOCO PRODUCTS COMPANY, OF HARTSVILLE, SOUTH CAROLINA, A CORPORATION OF SOUTH CAROLINA.

MACHINE FOR MAKING PAPER CONES.

Application filed November 1, 1926. Serial No. 145,609.

The present invention relates to machines for making paper tubes or cones, and particularly to machines for making paper cones such as are used in large numbers in the textile industries.

The purpose of the invention, generally stated, is to provide a tube or cone making machine having a number of novel features of construction whereby articles of this class may be made quickly, accurately, and at low cost. In the manufacture of the well known truncated paper cone it is desirable to use blanks having tapered or deckle edges so that neither the inner nor the outer surface of the resulting cone will be marred by a projecting edge, which edge is undesirable for a number of reasons. By using a deckle edge blank paper cones may be made having both inner and outer surfaces which are truly circular in transverse section. The manufacture of cones from deckle edged blanks involves a difficulty not present in the manufacture of cones from blanks having no deckle edges, this difficulty being in securing the forward edge of the blank to the mandrel prior to the winding operation, it having been found impracticable to merely insert the edge of the blank in a shallow slot in the mandrel as is possible in the manufacture of cones not having deckle edges.

In the patent to G. H. Kennedy, No. 1,482,849, a mandrel is disclosed by means of which deckle edged cones may be satisfactorily manufactured and in my Patent No. 1,528,248 another type of mandrel is suggested by which this may be done. The present invention provides a mandrel of the general type disclosed in these two prior patents in that it is adapted to wind blanks having deckle edges quickly into cones but it embodies certain features of construction not found in these or other prior cone winding devices. It will be understood that after the cone is wound both ends thereof are trued by a trimming operation, spaced trimming knives descending and bearing against the cone while it is still on the rotating mandrel, a portion of the nose of the cone and a portion of the base being removed so that the top and bottom edges are truly circular and are disposed in parallel planes normal to the axis of the cone. If any part of the cone projects into a holding slot or other depression in the mandrel this part cannot be severed by the cutting knives since these knives cannot reach it. The mandrel of the cone winding machine which I have now devised and will hereinafter describe is so designed that the movement of trimming it presents a substantially solid surface snugly fitting the inside of the freshly wound cone so that the trimming operation may be carried out quickly and with the certainty of completely parting the portions to be trimmed off from the body of the cone. A mandrel of this type presents the advantage that the trimming knives may be adjusted to cut at any desired point along the length of the mandrel and need not be positioned only at predetermined points. A further advantage of the machine consists in the fact that the mandrel provides means for positively forcing the inner deckle edge of the cone against the next convolution thereof after winding so that this edge firmly adheres thereto. A still further advantage consists in the fact that the mandrel may be made to collapse if desired, that is, the bearing area of the cone on the mandrel may be decreased prior to the time of removal of the cone from the mandrel so that such removal may be easily effected.

Other novel features and advantages of my improved mechanism will become apparent to those skilled in the art as it is disclosed in the following detailed description taken with the accompanying drawings. It will be realized that one embodiment only of the invention is set forth by way of example but that the invention is not limited to this exact disclosure since the design and arrangement of its component elements may be varied widely in adapting the same to different classes of work and different types of machines.

In the drawings:

Figure 1 is a side elevation of portion of a machine for winding cones and tubes showing one embodiment of the present invention but not showing many of the conventional elements of such machine which are old and well known in the art;

Figure 2 is a plan view of the mandrel

shown in Figure 1, a paper blank being illustrated as it appears when engaged by the mandrel just prior to a winding operation;

Figure 3 is an end view of the machine as viewed from the left of Figure 1;

Figure 4 is a section on line 4—4 of Figure 1;

Figure 5 is an axial section thru the mandrel and its operating spindle;

Figures 6, 7, 8, 9 and 10 are sections thru the mandrel on the line A—A of Figure 1 parts being shown in different relative positions for the purpose of illustrating a sequence of operations;

Figure 11 is an axial section thru the mandrel showing its relatively removable parts in a different relationship from that in which they are shown in Figure 5; and

Figure 12 is a side elevation of a modified form of mandrel partly broken away.

A portion of the frame of the machine is indicated at 10, this frame being preferably of steel or cast iron and of conventional type, its essential function being to provide a support for the mandrel, the cutting knives and the operating mechanisms for these instrumentalities as well as to provide a support for the blank feeding and pasting mechanism, and other essential portions of a tube or core winding machine, but which are omitted from the drawings for the sake of clearness. The mandrel itself is indicated generally at M, this mandrel being conical in form and substantially hollow as can be seen from Figure 5. It comprises the major portion 11 and the minor portion 12, the minor portion 12 constituting merely a triangular section of the conical side wall of the major portion. Portion 11 has its larger end secured to an annular block 13 which is interiorly threaded and has threaded engagement with one end of a hollow spindle 14 mounted in bearings 15 supported on pedestal 16 secured to the table 10. The minor portion 12 is attached to the end of an arm 17 integral with or detachably secured to a solid rod or spindle 18 which extends thru the bore of the cylindrical spindle 14. By sliding spindle 18 to the left (Figure 5) relatively to the coaxial spindle 14 the minor portion 12 of the mandrel may be, in fact, drawn inwardly so that its conical outer surface lies inside of the conical inside surface of the major portion of the mandrel. This position is shown in Figure 11 and also in Figures 8 and 9. After the parts have assumed the relative positions shown in Figure 11 spindle 18 may be rotated carrying portion 12 of the mandrel with it. Two adjacent edges 11′ and 12′ of the two relatively movable portions of the mandrel are spaced apart for the reception of the edge of a segmental paper blank B shown in Figure 2. This blank may be fed into the mandrel either longitudinally thereof, laterally, or at an angle by any well known type of blank feeding mechanism. After one edge of the blank has been received in this slot the mandrel is rotated by mechanism hereinafter to be described in the direction of the arrow C until the blank has been completely wound thereon, about three turns of the mandrel being necessary to complete this winding operation. The smaller portion 12 of the mandrel is then retracted as shown in Figure 8 and is moved around circumferentially inside of the larger portion in the direction of the arrow D (Figure 9) to contact with the flap, which is still substantially radially disposed within the mandrel. Continuing its rotation it bends this flap into substantial parallelism with the adjacent inner wall of the cone and finally is moved outwardly until its cylindrical outer surface is again in original or normal position, pressing the flap firmly against the inner wall of the cone and presenting again a conical mandrel having a substantially solid unbroken surface. The mandrel is still rotating and at this point the circular cutting knives 19 are moved downwardly to contact with the cone and rigidly sever a small portion from the nose of the cone and a small frustro-conical portion from the base. These knives are then lifted and a mandrel stripping mechanism of common type removes the cone and its severed end portions from the mandrel, after which the operation may be repeated. The operating mechanism for carrying out the above sequence of operation will now be described.

It will be seen from Figure 5 that the inner spindle 18 projects beyond the cylindrical outer spindle 14. Spindle 14 is provided with the slot 20 in its end into which a pin 21 extending radially from spindle 18 normally projects so that the two spindles may be only simultaneously rotated. Each spindle is provided with an operating pinion, spindle 14 having pinion 22 keyed thereon and spindle 18 having pinion 23 rotatably mounted thereon but connected thereto by means of a helical spring 24 one end of which is fastened in the pinion and the other end of which is fastened in shaft 18. Meshing with pinion 23 is a large gear wheel 25 mounted on a shaft 26 and meshing with pinion 22 is a gear wheel 27 also mounted on shaft 26. Shaft 26 is rotated from a shaft 28 by intermeshing gears 29 and 30, gear 29 being fixed on shaft 28 and gear 30 fixed on shaft 26. Shaft 28 is driven from shaft 31 thru the intermeshing elliptical gears 32 and shaft 31 is driven from shaft 33 thru intermittent gears 34 and 35. Finally, shaft 33 is driven from power shaft 36 thru speed reducing gears 37 and 38. The power shaft may be driven by any suitable means as by an electric motor or belt. While the power shaft is constantly rotating it will

be seen that because of the intermittent gears 34 and 35 the shaft 31, and hence the mandrel, will be only intermittently operated. During the periods of inaction the finished cone is removed and a fresh blank fed thereto and during the periods of mandrel rotation the winding of the blank and the trimming of the cone takes place. The diameters of gears 23, 25, 22 and 27 are so proportioned that pinion 23 is rotated slightly faster than pinion 22. For instance the gearing may be so designed that for every ten revolutions of pinion 22 pinion 23 will complete eleven revolutions, thus winding up the spring 24. During the ten revolutions of pinion 22 the blank will have been wound on the mandrel into the form of a cone. At this period in the operation of the machine the cam 40, mounted upon shaft 33 strikes the down turned end 41 of the reciprocable rod 42 moving the same toward the left (Figure 1) against the tension of spring 43. Rod 42 has an upwardly extending end portion 44 provided with a forked end 45 the two spaced portions of this fork lying in an annular groove formed in an annular collar 46 secured upon the end of the inner spindle 18. Movement of the rod 42 to the left therefore under the influence of cam 40 results in corresponding movement in the same direction of the inner spindle 18 and finally the pin 21 disengages the slot 20. As before explained the spring 24 has been tensioned during the preceding rotations of the mandrel and when pin 21 disengages slot 20 it becomes active to rotate spindle 18 thru 360° whereupon the pin 21 again enters slot 20 and this movement stops. During the movement of spindle 18 axially and in rotating thru 360° the minor portion 12 of the mandrel is retracted and rotated in the manner hereinbefore described and as shown in Figures 8, 9, 10 and 11, portion 12 resuming its normal position when pin 21 is again fully seated in slot 20. This sequence of operations occurs as the blank is wound, the action being entirely automatic and requiring no thought on the part of an attendant.

In Figure 1 it will be seen that a second cam 50 is so positioned as to intermittently engage and actuate the end 41 of sliding rod 42. This cam is not as high as cam 40 and does not effect the disengagement of pin 21 from slot 20. It does, however, result in axial movement of the inner spindle 18 to some extent so that the cylindrical surface of the minor portion 12 of the mandrel is withdrawn out of contact with the cone which has been wound thereon. The action of cam 50 is timed so that this movement of portion 12 of the mandrel occurs only after the completion of the winding of the cone and the purpose of this arrangement is to decrease the bearing area of the cone on the mandrel while the stripping mechanism is acting to remove the cone from the mandrel. Decreasing of this contact area of course makes the stripping operation easier. The mandrel may therefore be said to be "collapsible."

The knives 19 may be operated by any convenient form of mechanism. As shown they are mounted upon spaced arms 52 secured upon a rock shaft 53. This rock shaft is urged by spring 54 to rotate in a direction tending to move the knives toward the mandrel. Such movement is prevented however except at proper times by an arm 55 extending radially from rock shaft 53 and having a laterally turned lower end 56 which lies in the path of a cam 57. It is only when cam 57 disengages arm 56 that the spring is effective to press the knives against the mandrel. Continued rotation of the cam of course results in the withdrawal of the knives.

It may be desired to have more than one small portion of the mandrel movable relatively to the larger portion. In Figure 12 a modified form of mandrel is disclosed having two portions 112 which may be withdrawn within the larger portion 111 and rotated as in the case of the single portion 12. By increasing the area of that portion of the mandrel which may be withdrawn out of contact with the cone the bearing area of the cone on the mandrel is decreased and it may be removed therefrom by the stripping apparatus with even greater ease.

Obviously at the instant of completion of the cone the mandrel presents a substantially unbroken surface and no portion of the cone lies beneath this surface and out of reach of the cutting knives. The cutting knives may be adjusted along the mandrel to cut at any zone and short or long cones turned out as desired. This has not been possible heretofore with cone winding mandrels of known types.

The mandrel shown and described is primarily designed to receive blanks presented axially, or substantially axially, thereto. The blanks may be fed however, in any other manner and by any suitable mechanism, minor changes being made in the construction of the mandrel if necessary, so that the blanks may be freely received.

While I have described the invention as applied to a machine for winding cones, and this is the preferred embodiment thereof, it will be realized that without substantial modification it may be likewise employed in winding cylindrical tubes. It is not intended to limit the claims therefore to a cone winding machine and hence the term "conical" as used in the claims as describing the surface of the mandrel should be interpreted as including cylindrical mandrels as well. Obviously many changes may be made in

the design and arrangement of the component elements of the invention without departing from its spirit and scope.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A substantially hollow conical mandrel comprising two relatively movable portions the outer surfaces of which normally define the conical mandrel surface, and means for retracting one of said portions within the other and replacing the same in normal position, said means including coaxial spindles, one secured to each portion of the mandrel, and mechanism for effecting relative axial movement of said spindles.

2. A substantially hollow conical mandrel comprising two relatively movable portions the outer surfaces of which normally define the conical mandrel surface, and means for retracting one of said portions within the other, giving it a circumferential movement relatively to the other, and replacing the same in normal position.

3. A substantially hollow conical mandrel comprising two relatively movable portions the outer surfaces of which normally define the conical mandrel surface, and means for retracting one of said portions within the other, giving it a circumferential movement relatively to the other, and replacing the same in normal position, said means including coaxial spindles, one secured to each mandrel portion.

4. A mandrel for winding paper cones and the like comprising essentially two portions the outer surfaces of which, taken together, normally form a substantially complete surface of revolution, two adjacent edges of such portion being spaced apart to provide a slot for the introduction of the end of a paper blank, and means for retracting one of said portions within the other after a winding operation, effecting their relative rotation in such direction as to cause the inner member to contact with and swing the inwardly projecting end of the paper sheet toward the inner wall of the paper cone just formed, and restoring the retracted member to normal position thereby pressing the said end of the paper blank into close contact with the said inner wall.

5. A mandrel for winding paper cones and the like comprising a hollow conical member or shell having an aperture in its wall through which the leading end of a paper blank may be projected, and a second member which normally rotates with the first member or shell but which may be rotated relatively thereto and within the same after a winding operation, for the purpose set forth.

6. A mandrel for winding paper cones and the like comprising a hollow conical member or shell having an aperture in its wall through which the leading end of a paper blank may be projected, and a second member which may be rotated with the first member and may cooperate with said first member in securing the end of the blank during such rotation, which second member is rotatable relatively to the first member after a winding operation to swing the end of the blank outwardly and to cause it to contact with the body of the cone.

7. A mandrel for winding paper cones and the like comprising a hollow shell the surface of which comprises portion of a surface of revolution and is adapted to support the greater portion of the area of the inner wall of a cone wound thereon, the outer surface of the second member completing, when normally positioned, the conical surface of revolution save for an aperture through which the blank end projects, but being adapted to be withdrawn within the first member and revolve relatively thereto in such direction as to swing outwardly the inwardly projecting portion of the blank and thereafter to be advanced to press the same against the body of the cone.

8. A mandrel for winding paper cones and the like comprising a hollow conical member or shell through which the leading end of a paper blank may be projected, and a second member the outer surface of which normally completes the incomplete cone of revolution comprising the surface of the first member.

9. A mandrel for winding paper cones and the like comprising a hollow conical member the outer surface of which comprises the major portion of a surface of revolution, and a second member the outer surface of which normally substantially completes the said surface of revolution, said members having spaced edges forming a slot through which the leading edge of a paper blank may be projected into the interior of the mandrel, said members being axially movable relatively to each other and rotatable relatively to each other after having been axially displaced, for the purpose set forth.

10. A mandrel for winding paper cones and the like comprising a hollow conical member the outer surface of which comprises the major portion of a surface of revolution, and a second member the outer surface of which normally substantially completes the said surface of revolution, said members having spaced edges forming a slot through which the leading edge of a paper blank may be projected into the interior of the mandrel, the second member being retractable into the interior of the first and revoluble relatively to the first after being so retracted, for the purpose set forth.

11. A mandrel for winding paper cones and the like comprising a hollow conical member the outer surface of which comprises the major portion of a surface of revolution, and a second member the outer surface of which normally substantially completes the said surface of revolution, said members having spaced edges forming a slot through which the leading edge of a paper blank may be projected into the interior of the mandrel, said members being mounted respectively on co-axially arranged spindles and means being provided for automatically sliding said spindles relatively to each other in an axial direction, rotating them relatively to each other, and again sliding them relatively to original position.

12. A mandrel for winding paper cones and the like comprising a hollow conical member the outer surface of which comprises the major portion of a surface of revolution, and a second member the outer surface of which normally substantially completes the said surface of revolution, said members having spaced edges forming a slot through which the leading edge of a paper blank may be projected into the interior of the mandrel, said members being mounted on co-axially arranged spindles, and said spindles having interengaging means normally constraining them to rotate together, disengagement being effected by relative axial movement of the spindles.

13. A mandrel for winding paper cones and the like comprising a hollow conical member the outer surface of which comprises the major portion of a surface of revolution, and a second member the outer surface of which normally substantially completes the said surface of revolution, said members having spaced edges forming a slot through which the leading edge of a paper blank may be projected into the interior of the mandrel, said members being mounted on co-axially arranged spindles which normally have a pin and slot engagement with each other, thus constraining the spindles to rotate together, disengagement of the pin and slot connection being brought about by relative axial movement of the spindles.

14. The method of winding cones and the like from a blank sheet of material coated with paste comprising securing the blank to a rotatable mandrel with its leading edge below the surface of the mandrel, rotating the mandrel to wind the cone and thereafter pressing the leading edge of the blank outwardly into contact with the inner wall of the cone to cause the same to adhere thereto.

In testimony whereof I hereunto affix my signature.

CHARLES K. DUNLAP.