Feb. 18, 1964 H. FLEISHER 3,121,256

APPARATUS FOR FORMING CONTINUOUS PLASTIC CURLS

Filed Dec. 19, 1961

Fig. 1.

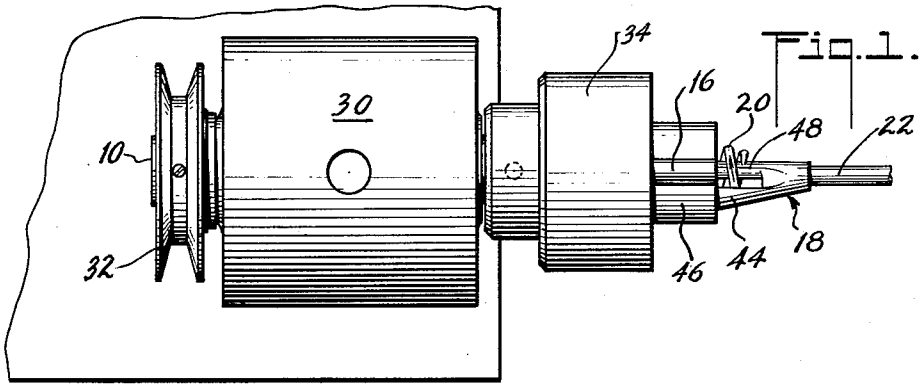
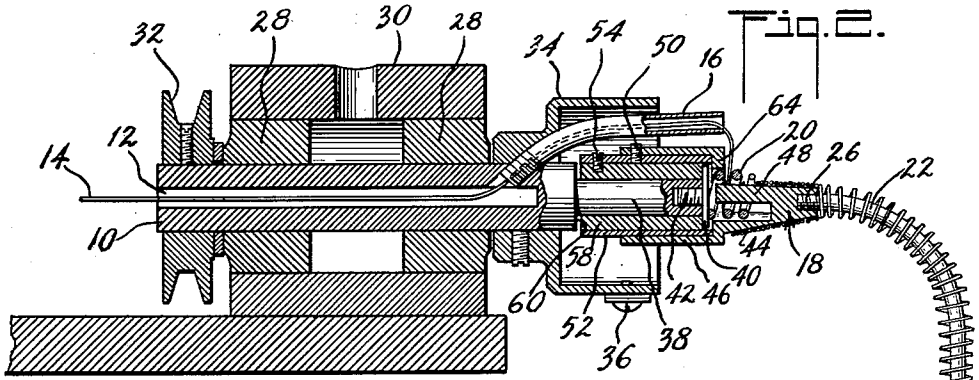


Fig. 2.



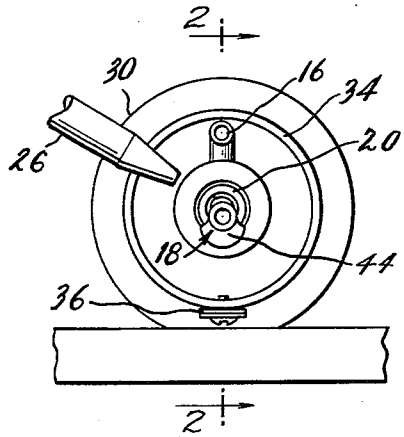


Fig. 3

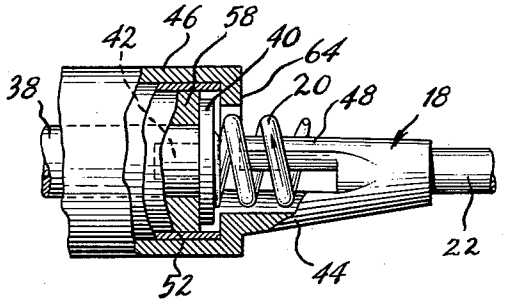
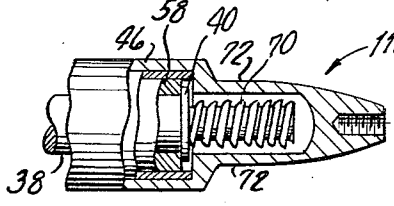


Fig. 4.

Fig. 5



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APPARATUS FOR FORMING CONTINUOUS PLASTIC CURLS

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The present invention relates to apparatus for automatically coiling threads or filaments of thermoplastic material into continuous coils, such as used for the artificial curls of dolls' hair.

It is an object of the present invention to provide apparatus for the purpose described which will curl the filamentary material into close, even coils at a continuous, high production rate.

It is another object of the present invention to provide apparatus, of the character described, which will form filamentary curls whose coils are substantially regularly and evenly spaced, so as to avoid the tangling of the coils due to their overlapping.

It is still another object of the present invention to provide apparatus, of the character described, which is of relatively simple and sturdy construction, embodying a minimum number of parts, that may be produced and assembled at relatively low cost and will be capable of operating continuously with a minimum of attention, care and repair.

The foregoing and other objects and advantages of the plastic filament coiling apparatus of the present invention will become more readily apparent to those skilled in the art from the embodiment thereof shown in the accompanying drawings and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the principles and practice of the invention more readily comprehensible, and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a top plan view of one embodiment of a filament coiling apparatus of the invention;

FIG. 2 is a vertical, sectional, partly elevational view of the apparatus of FIG. 1, substantially as taken on line 2—2 of FIG. 3;

FIG. 3 is an elevational view of the front end of the apparatus with the coil-receiving means omitted; and

FIG. 4 is an enlarged elevational view of the coiling head of the machine, partly broken away, and in section, to clarify structural details; and

FIG. 5 is a fragmentary, elevational view of a modified embodiment of the apparatus of the invention.

Generally stated, the present invention consists in the provision of apparatus for winding a thermoplastic filament about an arbor having means associated with the winding mechanism of the apparatus for engaging the windings of the filament to space them and to positively advance them on the arbor. More specifically stated, the invention utilizes a helical member, rotatable with the main driving shaft of the apparatus, which is arranged to overlap a stationary winding receiving arbor, and will engage individual windings and advance them along the arbor.

Referring now, in greater detail, to the embodiment of the invention illustrated in FIGS. 1 to 4, inclusive, of the drawings, the same is shown to consist, in the main, of a cylindrical rotary shaft 10, through the axial passage 12, of which a thread or filament 14, of a synthetic plastic material is fed to a radially-extending tubular guide or winder 16, which is connected with the passageway 14 at an easy angle and which lays a thread or filament around a stationary arbor, generally designated as

18, and between the convolutions or helical grooves of a winding advancing member or screw 20, that overlaps the winding receiving end of the arbor 18 and rotates with the shaft 10 in a direction away from the shaft 10.

By this arrangement, the windings of the filament 14 are simultaneously coiled about the arbor 18, which, preferably, tapers in the direction away from the winder 16 and over the convolutions or grooves of the helix 20, which regulates the spacing of the windings from one another and also advances them along the arbor 18 to a holder 22, which may consist of a rod having a threaded offset end portion 24, that is screwed into a correspondingly threaded recess formed in the end of the arbor 18, so that the holder rod 22 constitutes a separable extension for the arbor 18.

A conduit 26, for dry heat, such as steam, is associated with the apparatus in a manner to have its outlet end arranged to discharge the steam against the windings immediately as they emerge from the winding tube 16 to soften the filament, the windings being cooled and set in coiled form as they are advanced outwardly along the arbor 18.

The shaft 10, as shown in FIG. 2 of the drawings, is journalled in spaced bearings 28, disposed within a housing 30, and carries, at one end, a drive pulley 32, and, at the other end, a cup-like guard 34, which extends about the winding tube 16. The guard 34 may carry a counterweight 36, to balance the winder tube 16, as illustrated in FIG. 3 of the drawings, so as to enable the smooth operation of the apparatus at high speed. The shaft 10 is formed with a reduced portion 38, at its other end, which extends into and may project beyond the guard cup 34.

The winding advancing helix 20 is shown to comprise a helically-coiled, spirally-formed wire, with an open end which is secured by its other end to the flat head 40, of a threaded stud 42, that is screwed into the threaded recess formed in the end face of the reduced shaft portion 38.

The arbor 18 is shown as being of one preferred form, having a somewhat tapered outer end and a forked inner end consisting of a first, relatively wider arm 44, to the end of which is secured a cylindrical hub or sleeve 46, by which the arbor is hung or floated in relatively stationary relation, on the reduced end 38 of the shaft 10. The forked end of the arbor 18 is also provided with the relatively thin and relatively shorter second arm 48, which is of a thickness less than the diameter of the helix 20 and whose end fits into the open end of the helix 20, so that the helix 20 rotates about the arm 48 and in the space between it and the arm 44.

The sleeve 46 is supported in stationary relation on the reduced end 38 of the shaft 10 by being secured, as by a set screw 50, over an intermediate sleeve 52, which is, in turn, fitted over and secured, as by a screw 54, on a bearing sleeve 58, which rides freely on the reduced end 38 of the shaft 10. The bearing sleeve 58 is inhibited against inward movement by the shoulder 60, defining the inner end of the reduced shaft portion 38 and against outward movement by the head 40 of the threaded stud 42 that mounts the helix 20 and is of a size to overlap and form an abutment for the outer end of the bearing sleeve 48. Thus, the arbor 18, while supported and held on the reduced shaft section 38, is not fixed thereon, and does not rotate therewith, and permits the helix 20 to rotate about its arm 48.

The sleeve 46 connected to the arbor arm 44 may be formed with an inwardly-extending flange 64, that fits closely about the inner end of the helix 20, to avoid the snagging of filament windings on the inner end of the helix 20.

In the embodiment of the apparatus of the invention illustrated in FIG. 5 of the drawings, the filament-advancing means and the arbor structure are of modified character. In this embodiment the filament-advancing means comprises a helically-grooved pin or screw 70, which may be connected to the reduced shaft end 38 of the apparatus, in substantially the same or similar manner as the spiral 20 in FIGS. 1 to 4; namely, by being secured to or formed integrally with a head 40 of a stud 42 that is set into the end of the shaft portion 38, as shown in FIGS. 2 and 4.

The arbor of FIG. 5, generally designated as 118, is likewise formed with a forked end which consists, however, of a pair of spaced parallel arms 72, each of a thickness less than the diameter of the groove pin 70, and each secured by its end to the flange 64 of the arbor-supporting sleeve 46 in position to have the groove pin 70 extend between the arms 72 when the sleeve 46 is mounted over the shaft portion 38, as in the manner shown in FIGS. 2 and 4.

The unitary end portion of the arbor 118 may taper toward its free end and is preferably formed, in a manner similar to arbor 18 of FIGS. 1 to 4, with an axially-extending threaded recess in its free end, to receive the threaded end of the curl-receiving rod 22.

It will be apparent that the foregoing constructions each provides a compact, small-sized unit which is balanced so that it may be operated at high speed, to form continuous filamentary coil windings of uniform size and shape.

It will also be apparent that not only will the apparatus of the present invention form coils with windings of even size and shape, but that the engaging of the successive filament windings between the convolutions of the filament-advancing helix tends to keep the windings of the coils in regularly spaced relation without overlapping or entangling.

It will likewise be apparent that the forward movement of the windings by the convolutions of the helix, to positively advance such windings, permits the smooth and relatively rapid operation of the apparatus.

It will be further apparent that the apparatus of the present invention is of compact, small and sturdy construction, economical to produce, economical to operate, and will require little care and attention during operation, and will operate continuously and steadily with a minimum of adjustment and repairs.

It will be still further apparent that numerous modifications and variations in the thermoplastic filament coiling apparatus of the present invention may be made by anyone skilled in the art, in accordance with the principles of the invention hereinabove set forth, and without the exercise of any inventive ingenuity. I desire, therefore, to be protected for any and all such modifications and variations that may be made within the spirit of the invention and scope of the claims hereto appended.

What I claim is:

1. Apparatus for continuously coiling filamentary material comprising the combination of a rotary shaft, a thread serving guide carried by said shaft, an open ended screw carried by said shaft in position to engage the thread served by said guide and a stationary arbor having an inner arm projecting into the open end of said screw and an outer arm projecting over the outside of said screw.

2. Apparatus for continuously coiling filamentary material comprising the combination of a rotary shaft, a thread serving guide carried by said shaft, an open ended screw carried by said shaft in position to engage the thread served by said guide and a stationary arbor having an inner arm projecting into the open end of said screw, said outer arm being connected with and carried by a sleeve having a rotary mounting over the end of said shaft.

3. Apparatus for continuously coiling filamentary material comprising the combination of a rotary shaft, a thread serving guide carried by said shaft, an open ended screw carried by said shaft in position to engage the thread served by said guide and a stationary arbor having an inner arm projecting into the open end of said screw and an outer arm projecting over the outside of said screw, said open ended screw having a screw stud at the inner end of the same entered in the end of said rotary shaft.

4. Apparatus for forming continuous coils of filamentary plastic material, comprising the combination of a rotary shaft, a thread-serving guide carried by said shaft and rotating therewith, a relatively stationary winding-receiving arbor adjacent said shaft in position to receive filament windings from said thread-serving guide, means, including a helix, rotatable with said shaft overlapping the winding-receiving end of said arbor and engaging individual of filament windings as they are formed on said arbor to advance the same along said arbor.

5. The apparatus of claim 4, wherein said arbor is formed with a forked inner end and a sleeve is connected to said inner end of said arbor, a bearing sleeve is freely mounted over an end of said shaft and said arbor sleeve is fitted over and secured to said bearing sleeve.

6. The apparatus of claim 4, wherein said shaft is formed with a reduced end portion and said means rotatable with said shaft is secured to the end of said reduced shaft portion and said arbor is formed with a forked inner end having a sleeve secured thereto, said reduced shaft end having a bearing sleeve mounted thereover, and said arbor sleeve secured over said bearing sleeve, with the forked arbor end overlapping said rotatable means.

7. The apparatus of claim 4, wherein said helix comprises a wire coil.

8. The apparatus of claim 6, wherein said means rotatable with said shaft comprises a helically-grooved pin set into the end of said shaft, and wherein said winding-receiving arbor comprises a sleeve freely supported on said shaft, said sleeve having an opening wherethrough said helically-grooved pin projects, and having an arbor connected thereto, said arbor having a forked end, comprising spaced parallel arms, said arms each secured to said sleeve and each of a thickness less than the diameter of said helically-grooved pin.

9. The apparatus of claim 8, wherein the free end portion of said arbor is formed with an axially-extending recess adapted to receive the end of a winding-receiving rod therein.

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