Dec. 27, 1955 F. RICHARDS 2,728,314

APPARATUS FOR INSERTING HAIR INTO A DOLL'S HEAD

Filed May 28, 1952

4 Sheets-Sheet 1

FIG. 1.

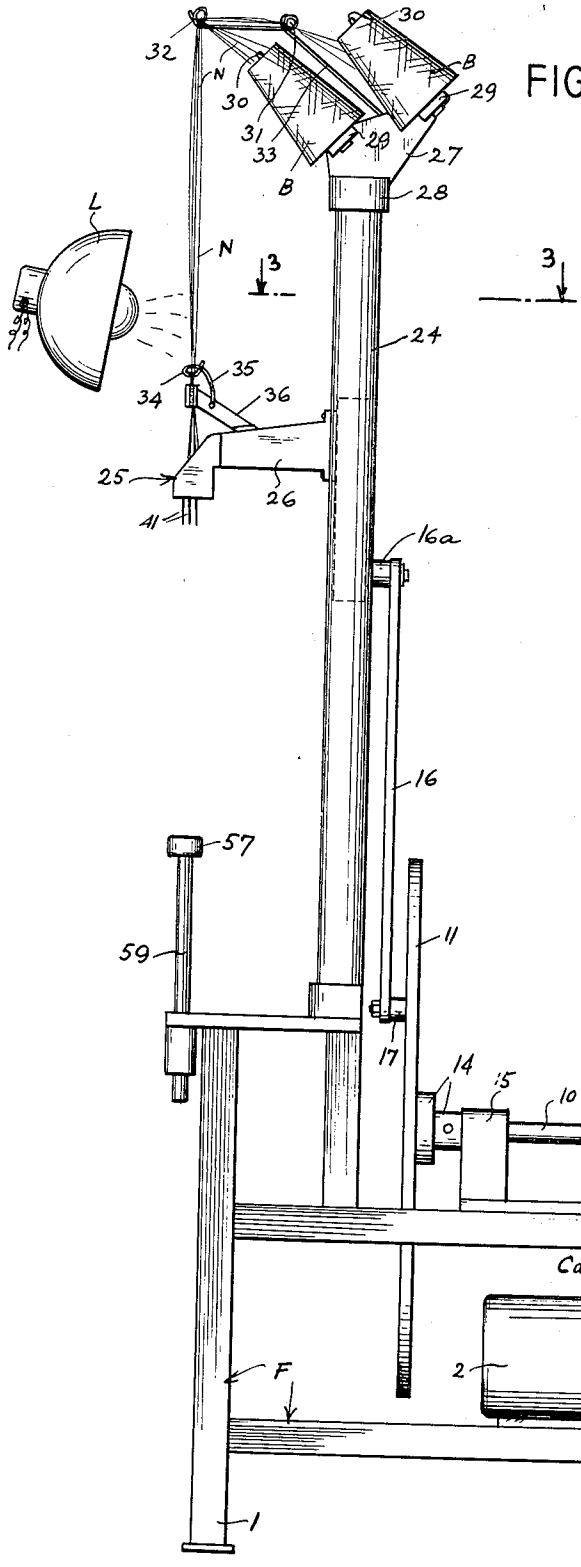


FIG. 4.

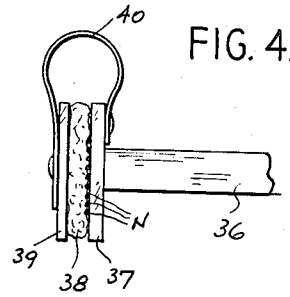
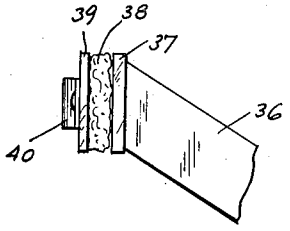


FIG. 5.



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APPARATUS FOR INSERTING HAIR INTO A DOLL'S HEAD

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FIG. 2.

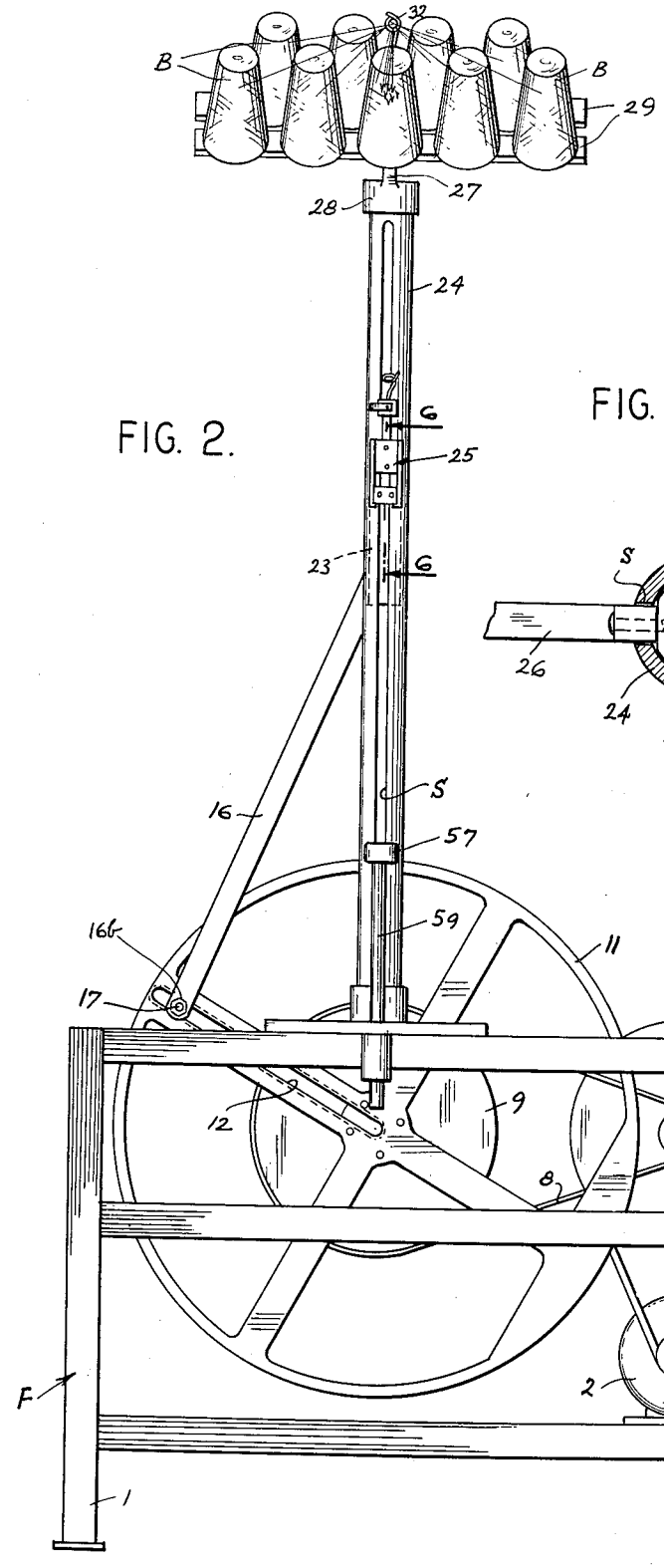
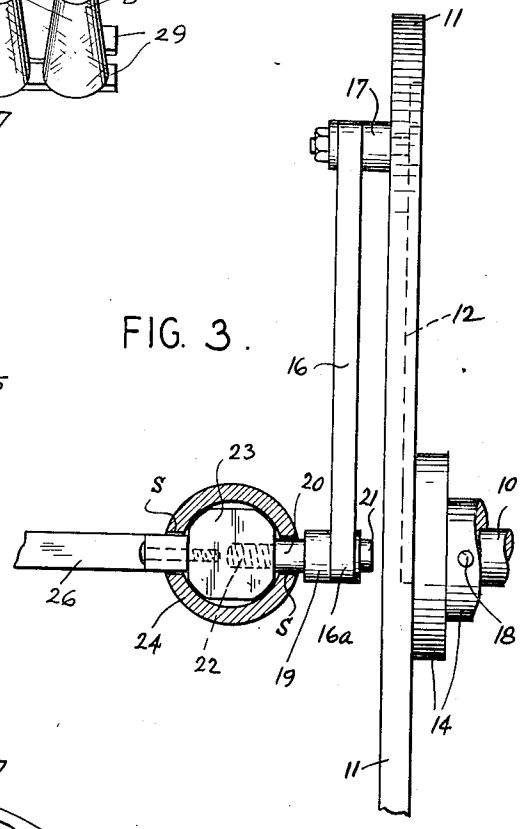


FIG. 3.



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APPARATUS FOR INSERTING HAIR INTO A DOLL'S HEAD

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FIG. 6.

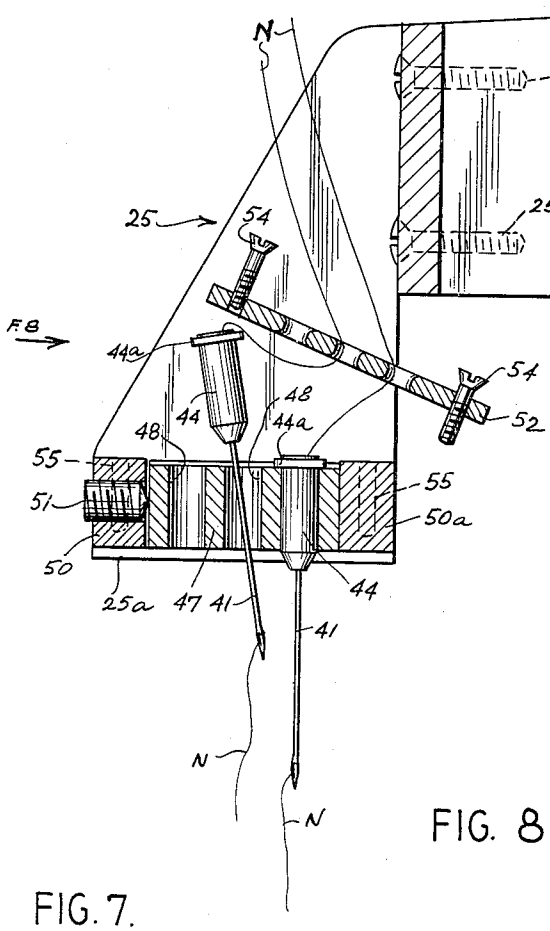


FIG. 7.

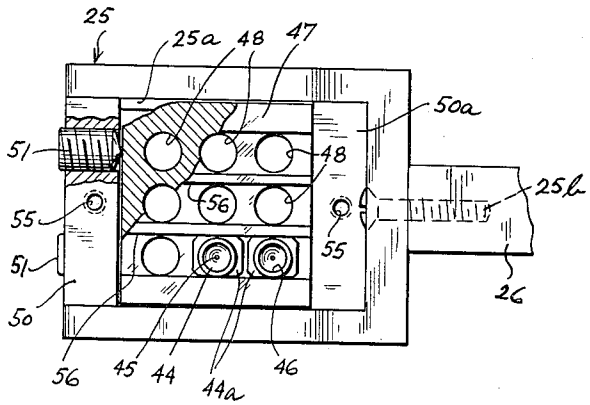
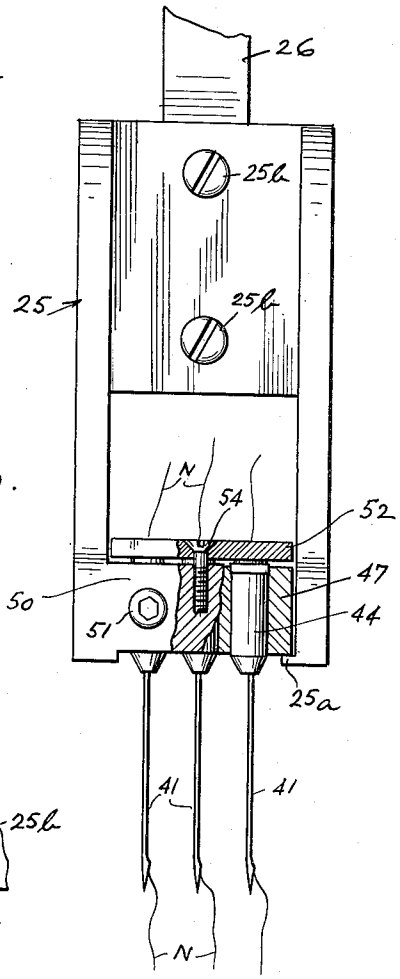


FIG. 8.



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APPARATUS FOR INSERTING HAIR INTO A DOLL'S HEAD

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FIG. 9.

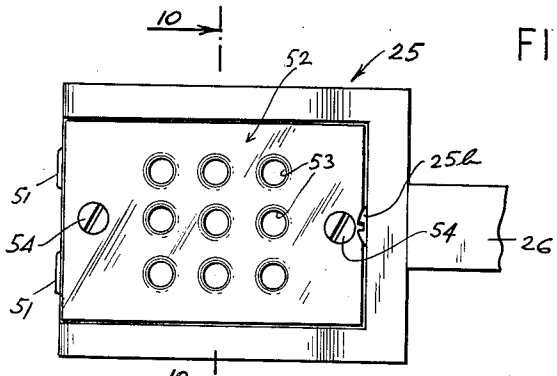


FIG. 11.

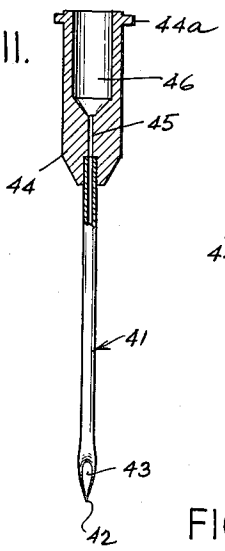
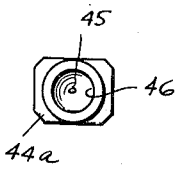


FIG. 12.



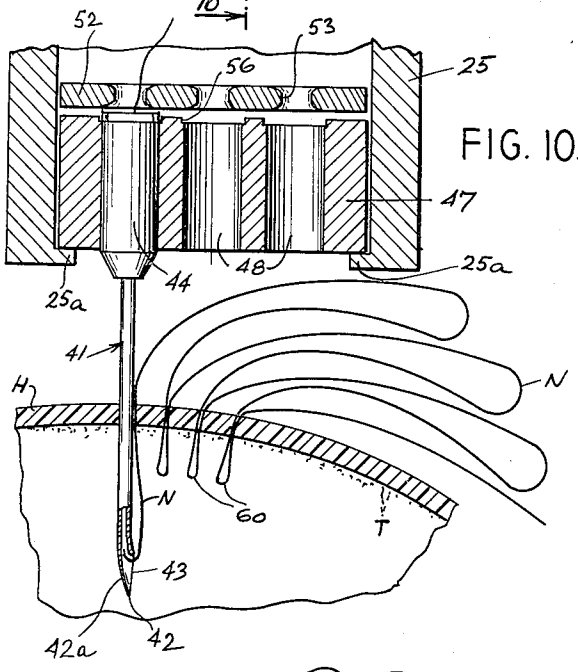
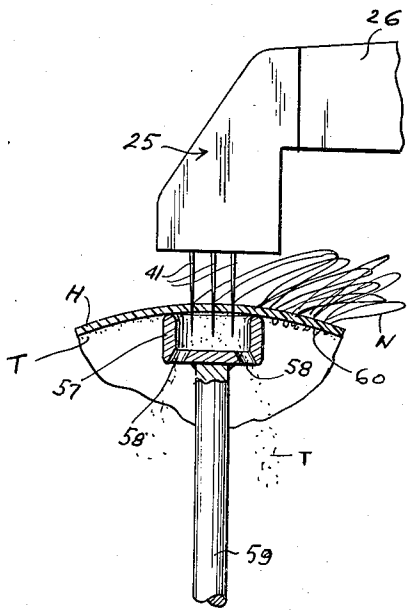


FIG. 10.

FIG. 13.



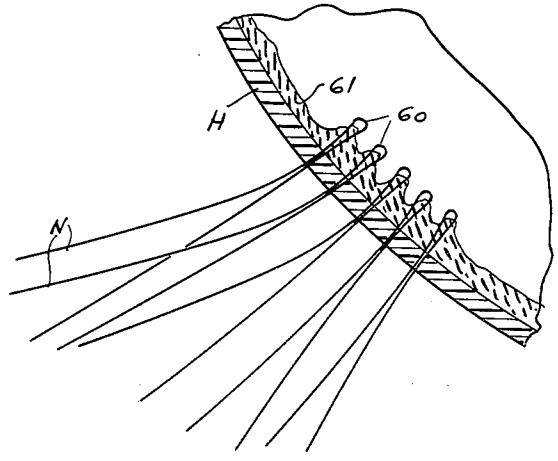


FIG. 14.

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Patented Dec. 27, 1955

2,728,314

APPARATUS FOR INSERTING HAIR INTO A DOLL'S HEAD

Frank Richards, Hollis, N. Y., assignor to Ideal Toy Corporation, Hollis, N. Y., a corporation of New York

Application May 28, 1952, Serial No. 290,518

2 Claims. (Cl. 112—79.5)

This invention relates to apparatus for inserting hair into a doll's head and in particular, an improved needle for said purpose.

As one example, the invention is particularly useful in fixing slightly twisted yarns which are made of vinylidene chloride fibers or filaments, to a doll head which is made of resilient vinyl plastic. Vinylidene chloride filaments or fibers, which are sold under the names of "Saran" and "Velon," are fully described in a book entitled "The New Fibers" by Sherman and Sherman, published in 1946 by D. Van Nostrand Company, Inc. As one example, a yarn or thread which is made of said filaments or fibers, consists of four such vinylidene chloride filaments or fibers, in which the thickness of each such filament or fiber is 0.0035 inch. This yarn or thread has a very low right-hand twist, and its individual fibers or filaments separate easily, so that the sewing operation has numerous difficulties.

By affixing yarns or threads or filaments of said material, or yarns or threads or filaments made of other materials, to a head which is made of material which can be pierced by a needle or other perforating means, an imitation wig is produced.

It is well-known to make such imitation wig or similar articles, with the use of needles of various types, such as barbed needles, forked needles and hollow needles, as disclosed in many United States Patents. Thus Lewis U. S. Patent No. 577,763, dated February 23, 1897, discloses a hollow embroidery needle. Johnson U. S. Patent No. 925,813, dated June 22, 1909, discloses a hollow needle for use in a sewing machine. Cole U. S. Patent No. 1,176,032, dated March 21, 1916, discloses a hollow turfing or tufting needle for making tufted rugs. Chern U. S. Patent No. 1,364,352, dated January 4, 1921, discloses a hollow embroidery needle which has a tapered end, like a hypodermic needle.

Also, the Mann U. S. Patent No. 2,253,635, dated August 26, 1941, discloses the use of a forked needle for forming tufts or loops of yarn in an elastic base material.

The use of a hollow needle presents numerous difficulties in uniform and high-speed production. When the needle is moved in its down stroke or penetrating stroke, it is necessary to provide sufficient friction between the loop-forming material and the wall of the bore of the hollow needle, so that the loop-forming material will move in unison with the hollow needle.

During the upstroke or return stroke of the hollow needle, the resilient vinylite or other resilient base material must grip the loop-forming material, in order to form an internal loop in the doll-head.

The loop-forming material is of irregular thickness and if it is a low-twist yarn, it tends to unwind. In using an ordinary hollow needle, like a hypodermic needle, the yarn clogs the bore of the needle, or it is not forced through the wall of the head. Also, an ordinary hollow needle punches out tiny discs of the vinylite plastic or other material of the doll-head, which often clogs the bore of the needle. Also, when a disc of the vinylite material is thus punched out, the wall of the material at the resultant hole often does not grip the loop-forming material.

It is impossible to use hooks or other devices for engaging the internal loops, when an imitation wig is being made on a doll-head, and it is necessary to provide external loops of uniform length.

According to this invention, I shape a standard hollow needle, like a hypodermic needle, in order to adapt it for the special purposes required herein. This standard hollow needle has a straight cylindrical shank which tapers to a conical piercing tip-part. The longitudinal bore of such standard needle has a straight longitudinal axis. Said longitudinal bore may be cylindrical and of uniform diameter, or said bore may be cylindrical and of uniform diameter in said cylindrical shank, and said bore may taper in said tapered tip-part, toward the point of the needle.

According to this invention, this tapered tip-part, which is of original frusto-conical shape, is bent laterally relative to the shank of the needle, around a bending axis which is perpendicular to the longitudinal axis of the bore.

Said bending axis is also perpendicular to the plane in which the axis of the bore is located.

This tapered tip-part is thus bent into hook-shape. This bending operation may extend into the lower end-part of the cylindrical shank.

The concave part of this hook is then ground off in a longitudinal plane which is parallel to the axis of the bore of the needle. This provides the needle with an opening which is in a plane which is parallel to the longitudinal bore. This opening is tapered and it preferably comes to a point at the tip of the needle. The edge of this opening is then mechanically rounded or blunted, so that it does not cut the loop-forming material.

Of course, the needle may be initially manufactured into this shape.

When this needle penetrates the wall of the head, said needle forms a straight slit, whose length is equal to the diameter of the shank of the needle, which is small. The loop-forming material is forced through this slit, during the penetrating stroke of the hollow needle. During the return stroke of the needle, the resilience of the material of the doll-head closes this short slit. The walls of this slit tightly grip the loop-forming material between the ends of said slit-walls, and said slit-walls tightly abut under pressure each other at both sides of the loop-forming material.

The slit-walls thus frictionally and firmly grip the loop-forming material during the return stroke of the needle, so that the needle slips freely during its return stroke, relative to the loop-forming material, even though said loop-forming material, or relatively thick parts thereof, fit snugly in the bore of the needle.

A greatly improved needle is thus provided.

As an additional improvement, I fix the inner or rear end of the needle to a head which has a bore of smaller diameter than the bore of the needle. The loop-forming material fits closely and even tightly in this head-bore, so that said head has a firm frictional grip on the loop-forming material, which is less than the frictional grip of the slit-walls. I thus prevent or minimize any slip between the loop-forming material and the needle, during the penetrating stroke of the needle.

I also provide means for actuating the needle in a stroke of regulated length, and I provide an adjustable mandrel or support for the head, which is adjusted so that internal loops of regulated length will be formed.

Other features of the special needle and other features and objects and advantages of the invention are disclosed in the annexed description and drawings.

Fig. 1 is a side elevation of a machine which embodies the invention;

Fig. 2 is a front elevation of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a detail top plan view which shows the optional braking or friction means for controlling and retarding the feed of the filaments of material;

Fig. 5 is a side elevation of Fig. 4;

Fig. 6 is a detail section on the line 6—6 of Fig. 2;

Fig. 7 is a top plan view of Fig. 6;

Fig. 8 is a side elevation of Fig. 6, taken in the direction of the arrow F8 of Fig. 6. The representation of the clamping cover of the machine is omitted in this view;

Fig. 9 is similar to Fig. 8, showing the clamping cover in position;

Fig. 10 is a sectional view on the line 10—10 of Fig. 9;

Fig. 11 is a detail sectional view, partially in elevation, which shows one of the hollow needles and the head to which the hollow needle is fixed. The representation of the needle is substantilaly to scale in Figs. 10 and 11;

Fig. 12 is a top plan view of Fig. 11;

Fig. 13 is a detail view, partially in vertical section, which shows the mandrel support for the wall of the head of the doll, and the application of the yarn or thread to the head of the doll; and

Fig. 14 is a detail sectional view which shows the finished product, after the ends of the external loops have been cut off.

As shown in the side elevation of Fig. 1, the machine is provided with a frame F which is supported upon a suitable number of feet 1. A motor 2 is fixed to the frame F. The shaft of this motor 2 is provided with a driving pulley 3. An endless belt 4 connects the pulley 3 to a companion driven pulley 5. As shown in Fig. 2, the driven pulley 5 is mounted upon a longitudinal shaft 6.

The driven pulley 5 is of larger diameter than the driving pulley 3, in order to provide speed reduction. A pulley 7, of smaller diameter than pulley 5, is fixed to the shaft 6. This pulley 7 is connected by an endless belt 8 to a pulley 9, which is of much larger diameter than the pulley 7. Other speed reduction means may be substituted.

The pulley 9 drives a main drive shaft 10. As shown in Fig. 2, a wheel 11 is fixed to the main drive shaft 10. This wheel 11 is provided with a radial slot 12. This wheel 11 has a boss 14, which is releasably fixed to the main drive shaft 10, by a pin 18 which is shown in Fig. 3. This main drive shaft 10 is rotatably mounted in bearings 15 which are fixed to the frame F.

The pulley 9 is releasably connected to the main drive shaft 10, by means of a conventional clutch C, whose control member C*a* can be operated by the hand or foot of the operator, in order to couple the pulley 9 to the shaft 10, or to uncouple the pulley 9 from the shaft 10.

The slot 12 of the wheel 11 functions as a crank arm. The bottom end 16*b* of a link 16 is pivotally and adjustably connected by an adjustable pivot pin 17 to the wall of the slot 12, in order to provide for an adjustable stroke of the link 16 by the rotation of wheel 11. The pivot pin 17 can be clamped to any selected part of the walls of slot 12.

Fig. 3 shows that the upper end 16*a* of the link 16 is pivotally connected to a hollow pivot pin 19, which has a reduced and hollow pin-extension 20. A screw 21, which has a threaded end 22, extends through the hollow pivot pin 19 and its extension 20. The threaded end 22 of said screw 21 is fixed to a block 23. This block 23 is vertically slidable in a vertical column 24, which is fixed to frame F. For this purpose, the vertical column 24 is provided with transversely alined and vertical slots S. The reduced extension 20 of pivot pin 19 is vertically slidable in one of these slots S. The block 23 is nonturnable in column 24. A needle-operating head 25 has a horizontal arm 26 which is fixed by a suitable screw to the vertically slidable block 23, so that the arm 26 is reciprocated vertically in unison with head 25 and block 23 and the upper end 16*a* of the link 16. An arm or plate 27 is fixed to a cap 28 which is releasably connected to the top of the column 24.

Bobbin-supports 29 are fixed to said arm or plate 27. A set of bobbins B, on which the yarns or threads N are wound in respective helical layers, are mounted upon suitable spindles 30 which are fixed to the arms of the bobbin-supports 29. These bobbins B are not turned on their spindles 30, when the loop-forming material N is unwound from said bobbins. The threads or yarns N which are led off said bobbins B are initially led through a first eye 31, and then through a second or succeeding eye 32. These eyes 31 and 32 are formed by bending a wire which has a base portion 33, which is fixed to the arm or plate 27.

These eyes 31 and 32 are at the same horizontal level and they are spaced horizontally from each other. The threads or yarns N are led vertically downwardly from the second eye 32, in a path which is exposed to the infra-red rays of an optional lamp L, in order to heat the yarns or threads N and make them more flexible. The heated and flexible yarns or threads N are led vertically from second eye 32 and are then passed through a third eye 34, which is formed by bending a wire 35, whose lower end is fixed to an arm or rod 36, which is fixed to the arm 26. The yarns or threads N are then led vertically and parallel to each other, as shown in Fig.4, between a rigid bar 37 and a soft resilient pad of friction or braking material 38. This friction pad 38 is fixed to a bar 39. The bar 37 is fixed to arm 36. A compression blade spring 40 has one leg fixed to the rigid bar 37 and another leg fixed to the rigid bar 39. The force of the braking or friction spring 40 is selected, in order to subject the vertical and parallel yarns or threads N to suitable retarding friction, as they pass between the rigid bar 37 and the soft and resilient friction pad 38. This friction device may be omitted.

As shown substantially to scale in Figs. 10 and 11, the needle 41 has a straight cylindrical shank, which has a straight cylindrical bore, which is of uniform diameter in this embodiment. The tip part of the needle 42 has a convex surface element 42*a* in the vertical plane of Fig. 10. It may be assumed that the original needle, which has an original straight axis, like a conventional hypodermic needle, is held in the vertical position of Fig. 10, and that the tip-part of this original needle is bent counterclockwise, so as to curve said tip-part into a slightly bent or hook-shape, which is lateral relative to the shank of the needle.

The concave part of this hook-shape is then ground in a vertical plane, which is perpendicular to the plane of Fig. 10, in order to provide an opening 43, whose edge is in said vertical plane. This edge of opening 43 is of tapered shape and it is in a vertical or longitudinal plane which is parallel to the straight axis of the shank of the needle. This edge of opening 43 is then mechanically rounded or blunted, so that it does not cut the loop-forming material N.

The upper or inner end of needle 41 is fixed to a needle-head 44, which has an external flange 44*a*, an inlet recess 46, and a bottom or outlet bore 45, which is of smaller diameter than the bore of needle 41. Said needle-head 44 is shown substantially to scale in Fig. 11.

As shown in Fig. 10, a needle-holder block 47 rests upon an annular flange 25*a*, which is provided at the bottom of the needle-operating head 25. This block 47 has a series of vertical and cylindrical bores 48. A cylindrical head 44 is located in each bore 48. Each head 44 has a flange 44*a*, which is supported on a respective shoulder of the block 47.

In addition to resting upon the flange 25*a* of the head 25, additional means are provided for fixing the block 47 to the head 25. As shown in Fig. 7, bars 50 and 50*a* are fixed to the head 25. These bars 50 and 50*a* may be integral with the head 25. The bar 50 is pro-

vided with clamping screws **51**, which extend through tapped bores of the bar **50**, in order firmly to clamp the holder **47** between the bars **50** and **50***a*. Figs. 6 and 7 also show that the head **25** is fixed to the arm **26** by means of screws **25***b*.

Fig. 10 shows a clamping cover **52** which has vertical bores **53** which are alined with the bores **48** of the block **47**. Each bore **53** has an annular wall of convex shape. These bores **53** are of smaller diameter than the bores **48** of the block **47**. This cover **52** is releasably fixed to the bars **50** and **50***a*, by means of screws **54**, whose threaded ends enter tapped bores **55** of the bars **50** and **50***a*. The representation of the cover **52** is omitted in Fig. 7.

When the cover **52** is clamped to the bars **50** and **50***a*, said cover abuts the tops of the heads **44**, thus firmly clamping said heads **44** in position. The yarns or threads N are led through the respective bores **53**, and through the respective recesses **46** of the fine bores **45** to the respective hollow needles **41** and through said needles **41**.

As shown in Fig. 12, the flanges **44***a* which are provided at the tops of the heads **44**, are of general rectangular shape, with cut away corners. As shown in Fig. 7, the top of the block **47** is provided with grooves **56** which have straight and parallel edges, with which the straight and parallel edges of the flanges **44***a* interfit, so that the heads **44** and their hollow needles **41** can not turn relative to the block **47**.

The flanges **44***a* are sufficiently large to rest upon the shoulders which are provided by the grooves **56**.

As shown in Fig. 6, the clamping cover **52** can be easily removed by loosening the screws **54**. Hence, if one of these thin and fragile needles **41** breaks during the sewing, the machine can be temporarily stopped, the clamping cover **52** can be removed, and the defective needle **41** can be removed and replaced, while the other needles remain in position. Also, if one of the yarns or threads N breaks, the respective needle **41** can be easily removed and rethreaded.

The block **47** can be easily removed and a new block can be inserted, thus providing any selected number of needles.

Fig. 13 shows a part of the head H of the doll. This head H is supported at a part of its inner wall upon a conventional annular cylindrical support or mandrel **57**, whose bottom wall is provided with openings **58**. This rigid mandrel **57** is supported upon a rod **59**, which is adjustably fixed to the frame F.

In operation, the link **16** reciprocates the head **25** and the needles **41**. When the needles **41** are at the upper ends of their vertical strokes, the operator shifts the doll-head H, in order to present new surfaces of the head H to the piercing and sewing action of the needles **41**, upon their next down stroke. The needles **41** form loops or bights **60** of the yarns or filaments N at the interior face of the head H. The entire head H can thus be covered with filaments N, in order to make an imitation wig. After the sewing operation has been completed, a layer of adhesive **61** is applied to the inner face of the head, and when this adhesive layer **61** has set, the inner loops **60** are firmly held in position.

Before sewing the yarns or filaments N to the head H, the interior face of the wall of the head H is provided with a thin coating of adherent talcum powder T or the like. The coating of talcum powder acts as a powder lubricant, so that the hollow needles **41** are lubricated at each stroke, thus minimizing breakage of the thin and fragile needles **41**. Some of the talcum powder T is shaken off the head H by the sewing action of the needles **41**, and this talcum powder can escape through the openings **58**.

The length of each inner loop **60** may be approximately 0.025 inch.

After the completion of the sewing operation, the yarns or threads N form closed loops at the exterior of the head H, as shown in Fig. 10 and Fig. 13. The ends of these outer loops are removed by shearing, so that the final wig has separated yarns or threads N, as shown in Fig. 14.

The length of the yarns or threads N exterior to the head H, is regulated by regulating the length of the vertical stroke of the block **23**, which is adjusted by adjusting the position of the pivot pin **17** in the slot **12**. The rod **59** which supports the mandrel **57**, is vertically adjustable relative to the frame F, so that the vertical position of the mandrel **57** can be manually adjusted, in accordance with the adjustment with the length of the vertical stroke of the block **23**.

A single needle **41** can be operated by hand, so that a true method is disclosed herein, whereby a thin slit is formed in the head H or other material in any manner, a yarn or thread or filament is pushed through said slit while it is open, and a part of said yarn or thread or filament is retained in the closed slit, inwardly of said head H.

Also, instead of using a needle **41** which acts both to slit the head and to force a yarn or thread or filament partially through said slit while it is held open, a thin hand piercing tool could be used to form the slit, and the thread or yarn or filament could then be pushed by a hand-operated tool through said slit while it is held open, as by using the familiar forked needle or pushing tool.

By using the improved combination slitting and pushing needle **41**, the machine can be operated at reasonably high speed and with uniform results.

As shown in Fig. 11, the edge or wall of the opening **43** is forwardly tapered to the piercing tip **42** of the tufting needle **41**. This direction of forward taper is a downward direction in Fig. 11. This edge or wall of opening **43** has two substantially straight legs which extend to the piercing tip **42**, and a slightly concave rear end, so that said edge or wall of opening **43** is of substantially triangular contour, but without sharp points or edges, save at the piercing tip **42**.

The slits which are formed by the needles are so thin as to be invisible in the finished article of manufacture.

The improved needle can be used as a sewing needle, in addition to being used as a tufting needle.

The improved tufting needle has a convexo-concave axis at its tip, and the opening **43** is in a plane which is at the concave side of said convexo-concave axis. This convexo-concave axis has the contour of the line **42***a* in Fig. 10.

The plane of the edge of the opening **43** may be parallel to the longitudinal axis of the bore of the shank of the needle **41**, or said plane may be inclined to said axis. While it is preferred to use a needle which has a straight shank, the invention is not limited thereto, because curved needles, of the type used in blind-stitch machines, are well-known.

When I refer to the longitudinally disposed edge-plane of the edge of the opening **43**, I include an edge-plane which is vertical in Fig. 10, and which is transverse to the plane of Fig. 10, or said edge-plane may be inclined to the above-mentioned position. The edge-plane in Fig. 10 is slightly inclined to the vertical direction.

I have described a preferred embodiment of my invention, but numerous changes and omissions and substitutions and additions can be made without departing from its scope.

I claim:

1. In an apparatus for inserting severable hair into a doll's head, a needle which has a hollow cylindrical shank which is continuous with a hollow tip which has a piercing point, said tip having a tapered and blunted edge-wall whose narrowest part is at said piercing point, said edge-wall being sufficiently blunted to prevent severing severable hair, said edge-wall being in a plane which is parallel to the straight axis of said cylindrical shank, said tip having a rounded convex wall which is opposed laterally to said edge-wall, said tip being

the ground-off remaining part of an original hollow and convexo-concave and tapered hook-extension of said cylindrical shank, said edge-wall having a rounded and concave top part.

2. In an apparatus for inserting severable hair into a doll's head, a needle which has a hollow cylindrical shank which is continuous with a hollow tip which has a piercing point, said tip having a tapered and blunted edge whose narrowest part is at said piercing point, said edge wall being sufficiently blunted to prevent severing severable hair, said edge wall being in a plane which is parallel to the straight axis of said cylindrical shank, said tip having a convex wall which is opposed laterally to said edge-wall, said edge-wall having a rounded and concave top part.

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