June 18, 1946. C. W. JOHNSON 2,402,251

SEWING MACHINE NEEDLE BAR MECHANISM

Original Filed Sept. 7, 1940

FIG. 1

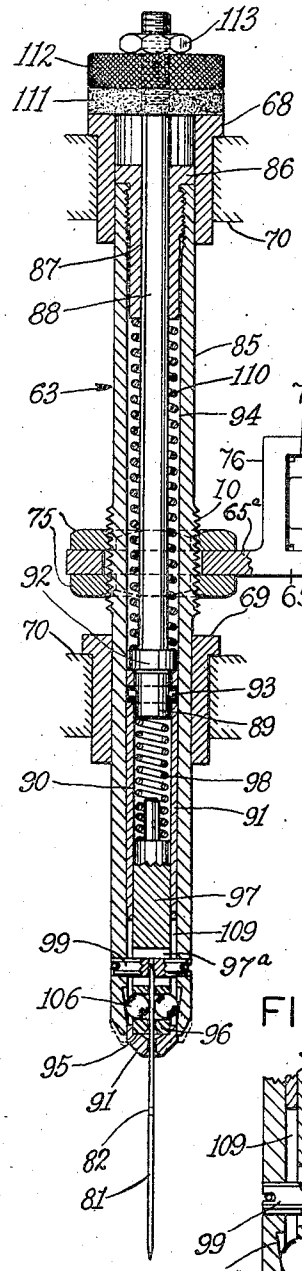


FIG. 2

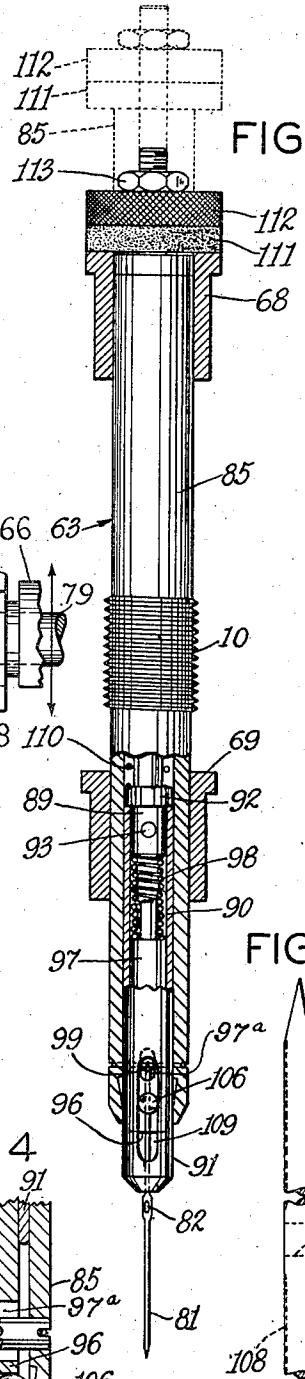


FIG. 3

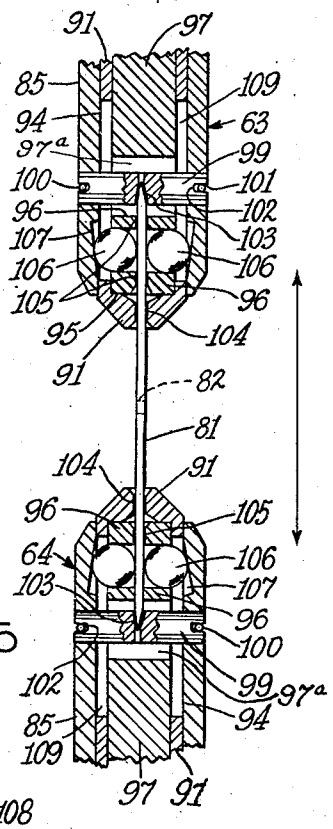


FIG. 4

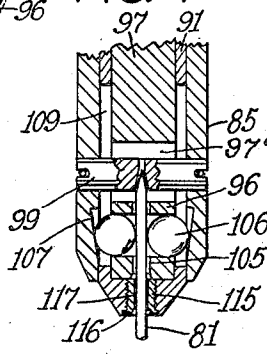


FIG. 5

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Patented June 18, 1946 2,402,251

UNITED STATES PATENT OFFICE

2,402,251

SEWING MACHINE NEEDLE BAR MECHANISM

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Original application September 7, 1940, Serial No. 355,738. Divided and this application June 24, 1942, Serial No. 448,189

17 Claims. (Cl. 112—171)

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This invention relates to sewing machines and more particularly to sewing machines of the under and over stitch type in which the ends of a double pointed needle are alternately grasped by needle bars and projected back and forth through the work as it is moved into the range of action of the needle.

This invention relates primarily to an improved needle spindle and chuck and constitutes a division of my co-pending application, Serial No. 355,738 filed September 7, 1940, for Sewing machine, and which application has matured into Patent No. 2,386,800, Oct. 16, 1945.

It is an object of my invention to provide an improved needle spindle bar and chuck or needle holding mechanism in which the spindle is detachably mounted on the needle operating bars for rapid and easy removal therefrom.

It is a further object of my invention to provide an improved needle bar or spindle and chuck mechanism in which means are provided for minimizing the breakage of needles.

It is an added object of my invention to provide an improved needle spindle and chuck mechanism wherein means are provided for supporting a needle in such a manner that the possibility of breaking or flexing the needle is greatly reduced during the operation of the mechanism which moves a spindle to and from the work.

My invention also consists in the provision of opposed needle supporting and holding devices including spindles and chucks, which devices are operative in timed relation to grip and release the ends of a double pointed needle in such a manner that the needle is always properly located and supported relative to the chucks and work and breakage of needles is maintained at a minimum.

A further object of my invention is to provide an improved needle bar and chuck mechanism for projecting a needle back and forth through the work, and for securing the needle in the chuck during the operations of the bar. This phase of my invention consists in the provision of a chuck having yieldingly placed elements which bear against the needle and make possible the use of any diameter of needle without the necessity of changing the needle chuck every time a different size of needle is used.

My invention further contemplates the provision of replaceable guide means for use with my improved needle chuck in order to accommodate various sizes of needles.

The invention further consists in the provision of improved needle stop means for use in

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the chucks in order to clearly position the needle point whenever the needle is held by said chuck and means for readily removing the stop so that it can be replaced or cleaned.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully described, and then set forth in the claims hereunto appended.

In the accompanying drawing, which forms a part of this specification, and wherein the several reference characters designate the same or like elements:

Figure 1 is an enlarged sectional view of the improved needle bar in needle receiving position;

Figure 2 is a view of a needle bar, partly in section, showing a needle grasped by the needle bar chuck;

Figure 3 is a partial sectional view of a part of the needle bar showing the needle as it is about to be transferred from one needle bar chuck to the other;

Figure 4 is an enlarged detail view of a portion of a modified needle bar equipped with a removable insert providing means for the use of different size needles; and

Figure 5 is an enlarged partial view of a round grooved needle adapted for use with the needle bar chuck.

Referring to the drawing which shows a preferred embodiment of the invention selected for purposes of illustration, Figures 1, 2 and 4 show an upper needle bar 63, and Figure 3 shows a lower needle bar 64 arranged in axial alignment with the upper needle bar for projecting a double pointed needle having an eye between the points with a thread having a fixed and a free end back and forth through the work. Bars 63 and 64 are provided with threads 10 by means of which they are detachably connected to actuating members 65 forming a part of the mechanism for reciprocating the bars in order to project the needle and thread back and forth through the work.

Figure 1 shows actuating member 65 connecting to an arm 66 which forms a part of an oscillating lever (not shown) for reciprocating needle bar 63 in proper timed relation with respect to lower needle bar 64, which is connected to an operating lever of the same type by similar connections (not shown). The upper bar is guided in bushings 68, 69 carried by lugs 70 forming a part of the machine frame (not shown). The lower bar is guided in bushings (not shown)

mounted on the machine. Threads 10 formed on bars 63, 64 make it possible to remove the bars quickly whenever it is necessary to clean the chucks or make any adjustments or repairs. If desired, bars 63, 64 can be mounted in any other suitable manner.

Each actuator member 65 is provided with an extension 65a having a bore through which a needle bar 63, 64 can be inserted. Lock nuts 75 threaded on threads 10 on needle bars 63, 64 engage opposite faces of extension 65a and clamp each respective needle bar 63, 64 in proper adjusted position relative to their respective actuating members 65 (Figure 1). The vertically extending portion 76 of each member 65 is provided with a track 77 in which slides a rectangular block 78 mounted on the end of a stud 79 fixed in arm 66. The sliding block provides a means for converting the oscillating motion of arm 66 which drives needle bar 63 and a similar arm (not shown) which operates lower needle bar 64 into vertical reciprocatory motion so that the two opposed bars alternately move to and from the work and project needle 81 back and forth therethrough.

The needle used in conjunction with the improved needle bars may be any type of double pointed needle having an eye between the points and preferably equidistant from each point. Since both needle bars are identical in construction, like reference numerals will be used to designate like parts, and only one need be described.

Referring to Figures 1 and 2, the upper needle bar 63, as shown, may consist of an outer shell 85 which at its upper end has a threaded portion receiving a plug 86, having an aperture 87 slightly larger than the diameter of the operating rod 88. Rod 88 at its lower end is provided with a plug portion 89 fitting into an aperture 90 of the inner shell 91 which is held against a shoulder 92 of rod 88 by means of a pin 93. The combined rod 88 and shell 91 are guided in aperture 87 of the plug 86 and in the aperture 94 of shell 85. The shell 91, at its lower end is provided with a seat 95 adapted to serve as a stop for the base of the cage or ball retainer portion 96 of a slidable plug 97 guided in the aperture 90 of shell 91. The plug 97 is normally held in the position shown in Figure 1, abutting the seat 95 by a compression spring 98. Plug 97 is provided with a slotted portion 97a which allows axial movement of plug 97 relative to pin 99 in shell 85.

The lower portion of shell 85 is equipped with a stud 99 (Figure 3), the same being held in place by a split wire ring 100 fitting into an annular groove 101 in shell 85 and in the open end slots 102 provided in stud 99, thereby providing a means for quick and easy removal for cleaning and replacement. The stud 99 is provided with an opening 103 formed to suit the point of the needle and serves to stop the needle at the same position each time it is transferred from one needle bar to the other.

It will be understood by those skilled in the art that in this type of machine the needle 81 is alternately grasped by the jaws of each needle bar. The action is such that as the lower needle bar 64 advances the needle inwardly through the work, it passes through the opening 104 in the lower end of shell 91 of the upper needle bar 63, and openings 105 in the cage 96 and stops against stud 99 in the opening 103 as seen in Figures 1 and 3. The upper and lower needle bars 63 and 64 are identical in construction and operate in the same manner for gripping and releasing the needle in projecting the same back and forth through the work so that the operation of only one needle bar need be described in detail. During the transfer period, shell 91 comes to rest because of the engagement of shock absorber 111 with a bushing 68 mounted on the frame of the machine (not shown). At the same time, shell 85 of the lower needle bar 64 connected to its driving arm (not shown) continues its upward movement relative to the cage 96 of plug 97, then resting against stop portion 95 of shell 91 so that due to this relative movement, tapered portion 107 of shell 85 moves away from rollers 106 to release the grip on the lower end of the needle held thereby. As shown in Figure 5, the round needle 81 may be provided with grooves 108 thereby providing better means for the balls 106 to properly obtain a firmer grip on the needle.

With the needle in position, the oscillating lever (not shown), which moves the needle bar, carries the shell 85 of the needle bar 63 upward, whereby the balls 106 become wedged between the needle 81 and the tapered wall 107 thus firmly gripping the needle, at the same time, the gripping balls of the lower needle bar are released and the continued ascent of shell 85 causes the needle 81 and ball retainer plug 97 also to rise, as seen in Figure 2. When the eye 82 of the needle 81 is in a position close to the base of shell 91, the stud 99 carried by shell 85 which has ascended freely in an elongated slot 109 in shell 91 held stationary with respect to shell 85 until shock absorber 111 is lifted from bushing 68, abuts the upper end of the slot 109, and the travel of shell 85 effects the movement of the several parts of the needle bar unit (as shown in dotted lines in Figure 2) thereby carrying the needle through the work. By supporting approximately half the length of the needle, the possibilities of breaking or flexing of the same is greatly reduced during subsequent operations presently to be described.

A spring 110 is confined in the aperture 94 of shell 85 and normally tends to hold a shock absorber 111 made of rubber or any other suitable material, which may be integral with a knurled nut 112 on rod 88, against the face of bushing 68. The tension of spring 110 is great enough to overcome the tension of spring 98 which, therefore, causes the latter to be compressed (Figure 2) during the needle gripping and positioning operation heretofore mentioned.

The upper needle bar 63 descends as a unit until the shock absorber 111 abuts the face of bushing 68 and arrests the travel of rod 88 and its coacting shell 91. The shell 85 and plug 97 continue their downward travel and finally the base of cage 96 abuts its seat 95 stopping the travel of plug 97 but the shell 85 continues downward slightly, as indicated by the dotted lines in Figure 1, thus releasing the gripper balls 106 freeing the needle. It is understood that the needle has passed through the work and entered into the lower needle bar 64 and is being gripped by the latter in the manner that the upper needle bar accomplishes the same. The movement of rod 88 and shell 91 of the lower needle bar unit is controlled in the same manner as the upper needle bar, that is, a bushing 68 and a shock absorber 111 (not shown) are provided for coaction with the lower needle bar 64 in the same manner as shock absorber 111 coacts with bushing 68 of the upper needle bar.

The nuts 112, on rods 88, provide means for adjusting the gripping elements 106—107 of each needle bar (Figures 1 and 2). When properly adjusted, nuts 112 are held in place by lock nuts

113. In transferring the needle from one needle bar to the other, both shells 85, for a short distance travel in unison, that is, one moves to release the needle and stops, while the opposing one grips the needle and continues its travel to carry the needle through the work.

Referring to Figure 4, means are shown whereby the needle bars can easily and quickly be adapted to receive different size needles. The base of sleeve 91 may be provided with a tapped hole 115 to receive a threaded insert or bushing 116 having an opening 117 which is slightly larger than the diameter of the needle to be used. If a needle of larger or smaller diameter is desired, member 116 can be readily removed and replaced by a like member having an opening to accommodate the new needle. The openings 105 in the cage 96 are large enough to accommodate the maximum size needle.

The invention above described may be varied in construction within the scope of the claims, for the particular device, selected to illustrate the invention, is but one of many possible concrete embodiments of the same. It is not, therefore, to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. A needle bar for a sewing machine comprising an outer shell, an inner shell movable in said outer shell and provided with a tapered needle engaging portion and a slotted portion, a pin provided with a needle receiving opening projecting through said slotted portion and removably mounted in said outer shell, a slide plug located for movement in and relative to said inner shell and provided with a slotted portion movable relative to said pin, and an opening for needle gripping elements, needle gripping elements in said opening, a spring engaging said plug and normally urging said elements into needle engaging relationship, a member connected with said inner shell, a spring bearing against said member, and a rod connected to said member for effecting relative movement between said outer and inner shells.

2. A needle bar for a sewing machine comprising an outer shell member and an inner shell member mounted for axial movement relative one to another, means for limiting the movement of said inner shell relative to said outer shell member, needle gripping elements coacting with said inner and outer shell, an actuator for said bar, means for effecting relative axial movement between said outer and inner shells to locate said inner shell in an extended position beyond the end of said outer shell to support that part of the needle which is held by said elements over the greater part of one-half of its length, and means for holding said inner shell in said position during a portion of the movement of said needle through the work.

3. A needle chuck for a sewing machine comprising an outer shell having a tapered inside wall, an inner shell movable in said outer shell, a slide plug located for movement in and relative to said inner shell, said inner shell being provided with a slotted portion and openings for needle gripping elements, a pin having a needle receiving opening projecting through the slotted portion of said inner shell and slide plug and removably mounted in said outer shell, needle gripping elements carried by said plug, a spring located in the inner shell engaging said plug and normally urging said elements into needle engaging relationship, a second spring bearing against the inner shell and located in the outer shell for normally urging said inner shell outward, and a rod connected to said inner shell for effecting relative movement between said outer and inner shell.

4. A needle chuck for a sewing machine comprising an outer shell, an inner shell movable in said outer shell and provided with a slotted portion, a slide plug located for movement in and relative to said inner shell, said plug provided with a slotted portion, a pin having a needle receiving opening projecting through the slotted portions of said inner shell and slide plug and removably mounted in said outer shell, a spring located within the inner shell engaging said plug and normally urging said plug outward, a second spring bearing against the inner shell and located within the outer shell, said spring normally urging said inner shell outward, a rod connected to said inner shell for effecting relative movement between said outer and inner shells, and means for gripping a needle inserted into said outer and inner shells and plug.

5. A needle chuck for a sewing machine consisting of an outer shell, an inner shell movably mounted in said outer shell, a plug movably mounted in said inner shell, springs bearing against said inner shell and plug, a transverse pin removably mounted in said outer shell and passing through openings in said inner shell and plug, and means carried by said plug for gripping a needle.

6. A needle chuck for a sewing machine consisting of an outer shell, an inner shell movably mounted in said outer shell, a plug movably mounted in said inner shell, springs bearing against said inner shell and plug, a transverse pin removably mounted in said outer shell and passing through openings in said inner shell and plug, mechanism for gripping a needle inserted through said inner shell and plug, and means removably mounted in said inner shell for accommodating different size needles.

7. A needle chuck for a sewing machine consisting of an outer shell, an inner shell, a member slidably mounted in said inner shell, springs bearing against said inner shell and member urging them into operative relationship, means removably mounted in the nose of said inner shell to receive needles of different diameters, said member having an opening in its base of sufficient size to receive the largest needle selected for use in said machine, and means for gripping a needle inserted through said inner shell and member.

8. A chuck for holding a needle in a sewing machine comprising relatively axially movable inner and outer sleeve members, a plug movably mounted in one of said sleeve members, springs for effecting cooperative relationship between said plug and inner sleeve member, means removably mounted in the nose of said inner sleeve member to receive needles of different diameters, a needle end receiving device mounted in said outer shell and aligned with said last-named means, and an actuator for said chuck for effecting relative axial movement between said sleeve members and plug for alternately gripping and releasing a needle inserted into said chuck.

9. A needle chuck for a sewing machine consisting of an outer shell, an inner shell, a plug, springs bearing against said inner shell and plug, a pin removably mounted in said outer shell and passing through openings in said inner shell and plug, means carried by said plug for gripping a

needle inserted through said inner shell and plug, and means for moving said inner shell beyond the outer shell to support a needle adjacent its eye to prevent said needle from bending and breaking.

10. A chuck for holding a needle in a sewing machine comprising a movable plug, movable sleeve members, springs urging said plug and one of said members into operating relationship, mechanism for gripping a needle inserted into the base ends of said plug and sleeve members, and means including one of said springs for causing said one of said sleeve members to move axially within said other sleeve member to a position adjacent to the center eye of said needle to give said needle support and rigidity during a portion of the sewing operation.

11. A chuck for holding a needle in a sewing machine comprising relatively movable sleeve members, means for gripping a needle inserted into said chuck, and means including a spring for moving one sleeve member axially and outwardly beyond the end of a second sleeve member to support a needle adjacent its eye during a portion of the sewing operation.

12. A chuck for holding a needle in a sewing machine comprising a pair of relatively axially movable sleeve members, gripping means associated with said members for gripping a needle inserted into said chuck, and means including a spring for effecting relative axial movement of one sleeve member beyond the end of a second sleeve member to a position where it rests adjacent the eye of the needle to give support to the needle.

13. A chuck for holding a needle in a sewing machine comprising a pair of relatively axially movable sleeve members, needle gripping means carried by one of said members for gripping a needle inserted into said chuck, and means including a spring constructed and arranged to effect the movement of one sleeve member axially relative to the other sleeve member to support a needle adjacent its eye during a portion of the sewing operation.

14. A chuck for holding a needle in a sewing machine comprising relatively movable inner and outer sleeve members, means carried by said inner member for gripping one end of a double pointed needle provided with an eye formed between said ends inserted into said chuck, means coacting with said members for locating the point of said end of said needle in said chuck, and an actuator for moving said chuck to and from work to be

sewed, and means coacting therewith constructed and arranged to effect the movement of said inner sleeve member axially relative to the outer sleeve member beyond the end of said outer sleeve member to support a needle adjacent its eye during a portion of the sewing operation.

15. In a needle bar for a sewing machine, a chuck for holding a needle comprising relatively movable inner and outer sleeve members, needle gripping means carried by one of said members for gripping a needle inserted into said chuck, said members being constructed and arranged for axial movement one relative to the other to effect the gripping of a needle for projection of the same through work to be sewed, a needle bar support and means formed on said outer sleeve member for quickly attaching and detaching said bar to said support on a machine.

16. In a needle bar for a sewing machine, a chuck for holding one end of a double pointed needle provided with an eye between its ends comprising, relatively movable sleeve members, a plug mounted for axial movement in one of said members, and needle gripping means supported by said plug for gripping said end of said needle inserted in said chuck, removable means mounted in the other of said sleeve members for positioning said end of said needle in said chuck, and means for effecting relative axial movement between said sleeve members to grip and release said needle.

17. In a needle bar for a sewing machine, a needle chuck comprising an outer shell, an inner shell movable in said outer shell and provided with a slotted portion, a slide plug located for movement in and relative to said inner shell, said plug provided with a slotted portion, a pin having a needle receiving opening projecting through the slotted portions of said inner shell and slide plug and removably mounted in said outer shell, a spring located within the inner shell engaging said plug and normally urging said plug outward, a second spring bearing against the inner shell and located within the outer shell, said spring normally urging said inner shell outward, a rod connected to said inner shell for effecting relative movement between said outer and inner shells, means for gripping a needle inserted into said outer and inner shells and plug, and means formed on said bar for quickly detachably connecting said bar to said machine.

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