July 16, 1946. R. C. AMIDON 2,403,961

KNITTING MACHINE NEEDLE AND MEANS FOR OPERATING SAME

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Fig. 1.

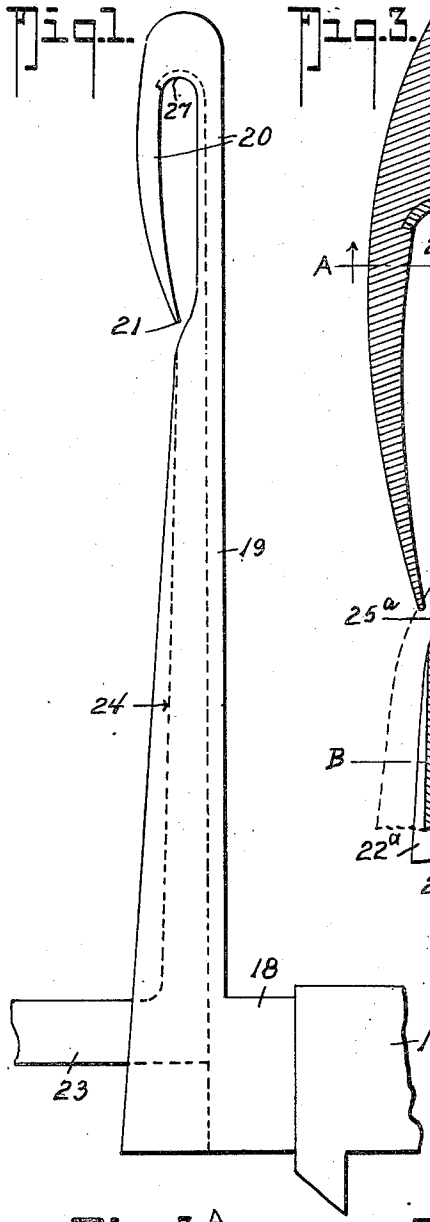



Fig. 3.

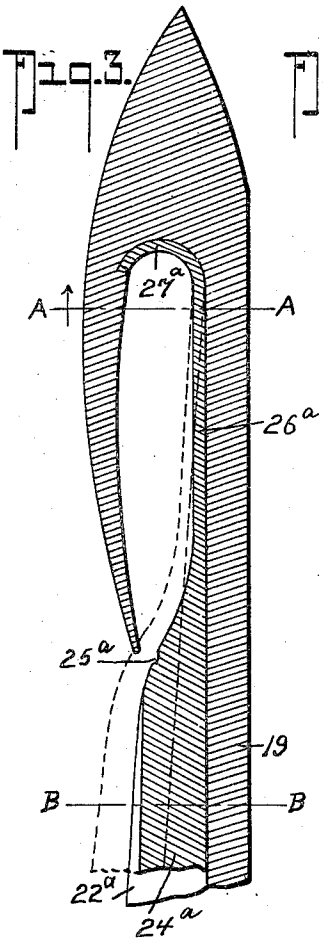



Fig. 2.

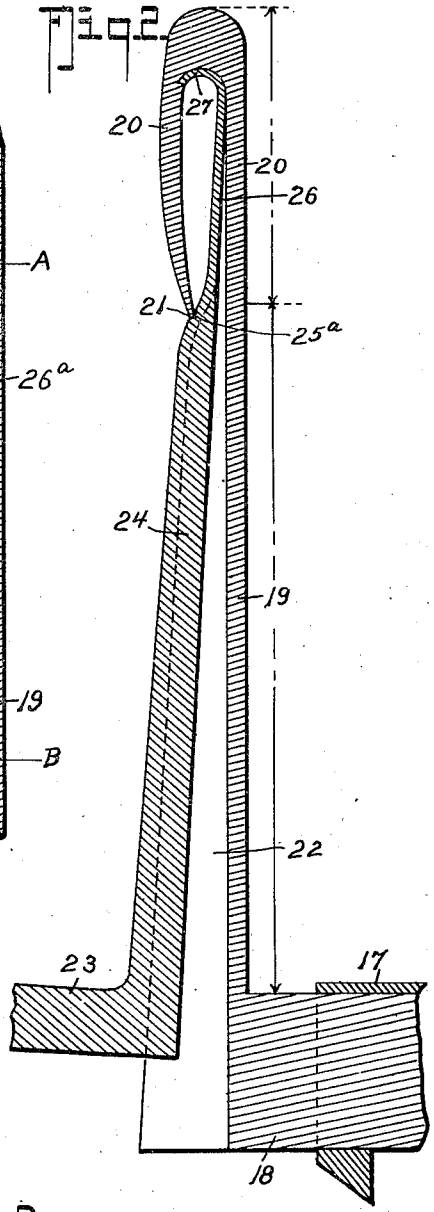



Fig. 3A.

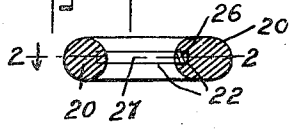
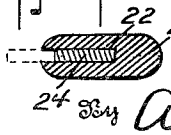



Fig. 3B.




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Fig. 5.

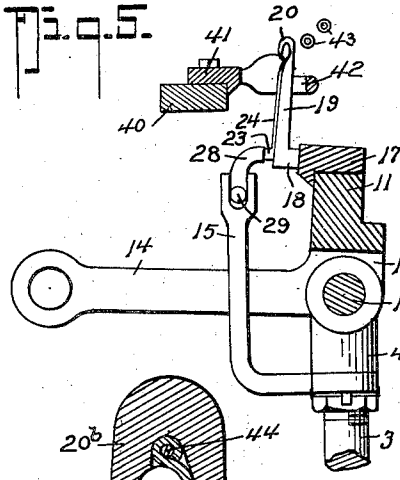
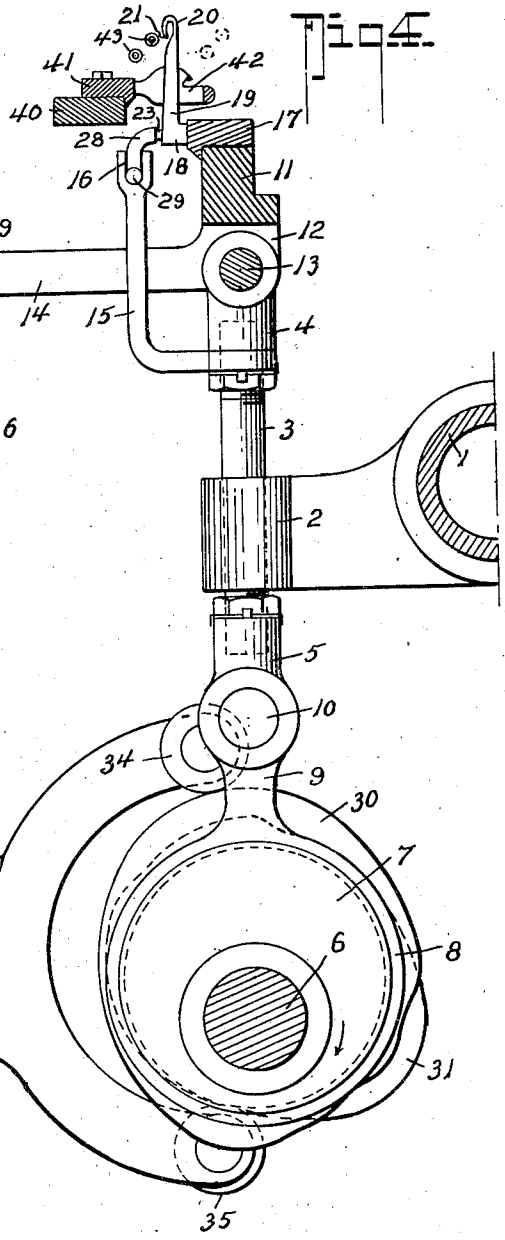



Fig. 12.

Fig. 4.




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KNITTING MACHINE NEEDLE AND MEANS FOR OPERATING SAME

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Fig. 7

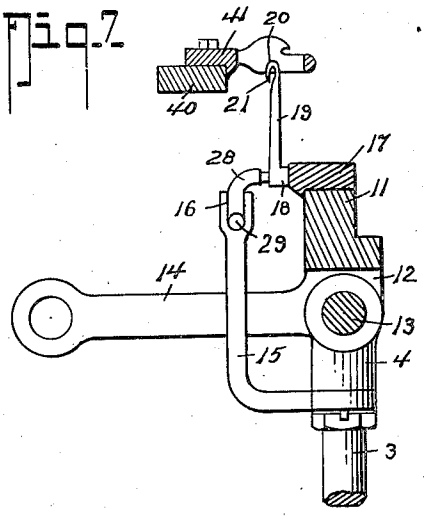



Fig. 6




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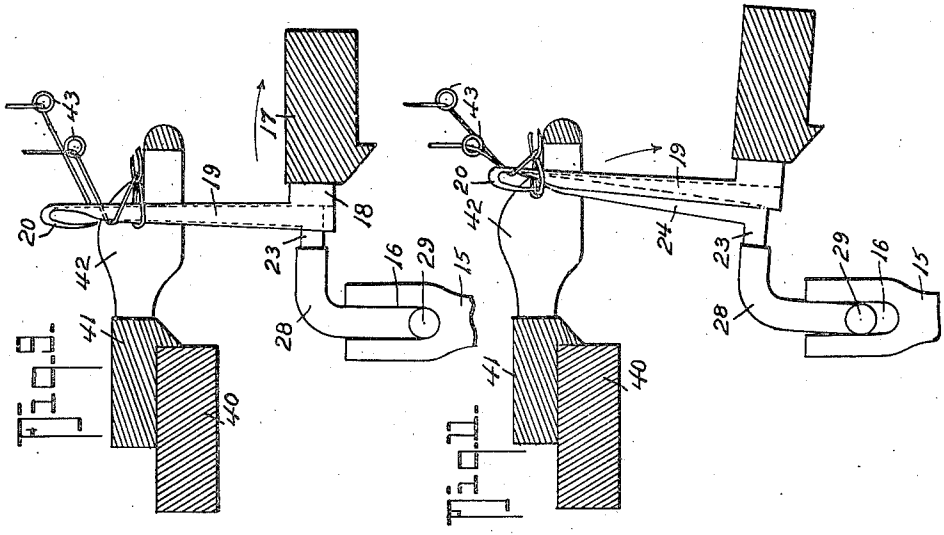


Fig. 9.



Fig. 11.

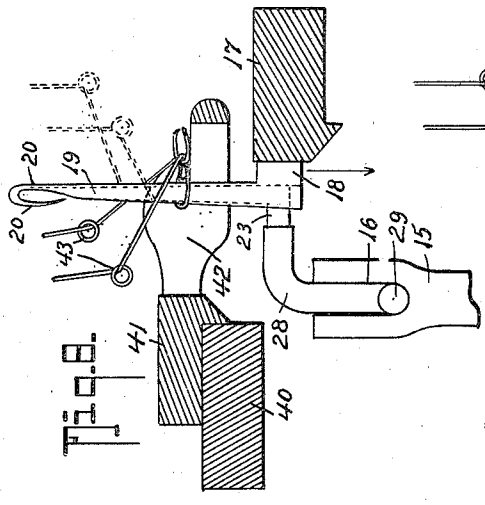


Fig. 8.

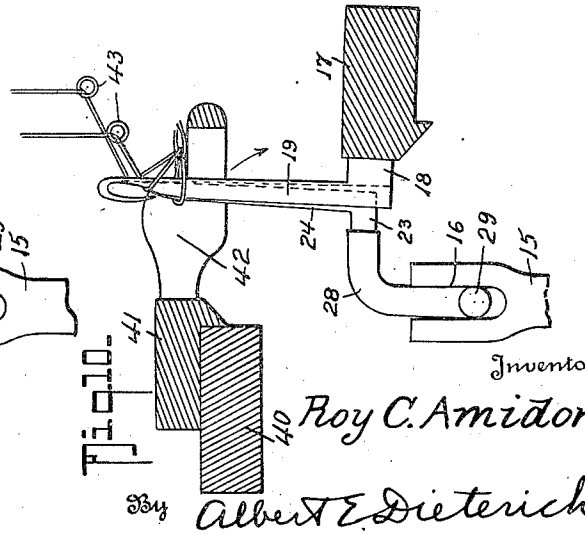


Fig. 10.

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Patented July 16, 1946

2,403,961

# UNITED STATES PATENT OFFICE

2,403,961

## KNITTING MACHINE NEEDLE AND MEANS FOR OPERATING SAME

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Application August 18, 1944, Serial No. 550,061

16 Claims. (Cl. 66—86)

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Knitting machine needles are of several types, namely spring beard needles, latch needles, and tongue needles. Heretofore, tongue needles usually have their tongues arranged to be moved separately from the needles so as to produce longitudinal motion of the tongue along the needle to open and close the thread passage between the needle point and the shank of the needle. Tongue needles are of three general sub-types. In one the tongue lies in a groove of the needle and moves longitudinally along the same; in another the needle is of tubular form and the tongue slides in the tube; in a third, which is a modification of the second subform, the needle has a diagonal bore through which the tongue is threaded. All these tongue needles which have been heretofore known are open to objections. The tongue and groove needle in which the tongue slides lengthwise in the groove, or conversely the needle slides along the tongue, the tongue and the walls of the needle groove are subject to considerable friction and wear. The needle by stress of the knitting operation may also be drawn away from the tongue. When the needle is one where the tongue slides in a tube, or passes through the shank of the needle, the size or gauge of the needle must be comparatively large or the tongue will have to be made so small in diameter that it will bend easily and not function properly. In the spring beard needle the beard is that part of the needle which, by pressure action, is made to close the thread passage of the needle to allow the threads to be drawn through the loop portions of the knitting stitches. The beard must be made of sufficient strength and resiliency to enable it to be bent so that the point of the beard will enter the recess of the needle shank to close the passage and again spring back to open the passage as soon as the beard presser shall have been withdrawn. The beard is held in contact with the beard presser during a substantial part of the knitting cycle and the parts are subjected to considerable friction which of course shortens the life of the needles. While bearded needles have been and are now being successfully used in knitting machines the machines are not run at speeds over approximately 500 R. P. M. Machines using latch needles must also be run at moderate speeds for satisfactory results to be produced.

My present invention therefore has for its object to overcome the objectionable features of the above mentioned needles so as to enable the needle to be successfully used on extremely high speed machines (speeds of 500 to 1000 R. P. M.) with needles of fine gauge.

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Generically my new and improved needle may be considered as a modified tongue type needle. It is made of two separate parts attached together at some portion of the upper part of the needle shank or hook part at a point above the thread passage. This permits that portion of the needle that is used as the hook to be so constructed as to absorb all of the stresses and shock of the needle while the thread or yarn is placed in the hook and at the time the needle is knocking over the stitch loop in the knitting operation.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends the invention further resides in those novel details of construction, combination and arrangement of parts all of which will be first fully described and then be specifically pointed out in the appended claims, reference being had to the accompanying drawings in which:

Fig. 1 is a highly magnified side elevational view of a needle embodying my invention.

Fig. 2 is a vertical section on the line 2—2 of Fig. 3A.

Fig. 3 is an enlarged detail section of a portion of the needle shown in Figs. 1 and 2 but provided with a point for use on machines that knit through a base cloth.

Fig. 3A is a cross section on the line A—A of Fig. 3.

Fig. 3B is a section taken on the line B—B of Fig. 3.

Fig. 4 is an elevation and part cross section of a part of a knitting machine employing my new needle, the needle being at its most elevated position.

Fig. 5 is a detail view similar to Fig. 4 with the needle moving down and tilting at the point where the needle point enters the sinker.

Fig. 6 is a view similar to Fig. 5 with the parts in the position they assume when the needle has reached the bottom of its stroke and is about to assume the vertical position again.

Fig. 7 is a detail view similar to Fig. 5 showing the needle again in its vertical position and starting on its up stroke.

Figs. 8 to 11 inclusive are diagrammatic views, parts being shown in section, hereinafter specifically referred to.

Fig. 12 is a detail view similar to Fig. 3 of a further modification.

In the drawings in which like numerals and letters of reference indicate like parts in all the figures, 1 designates a supporting pipe of the knitting machine, on which pipe the bearings 2 are

mounted. Only one bearing is shown but it will be understood that two or more are used in the knitting machine. A shaft 3 is vertically slidable in the bearing 2 and carries a needle bar support 4 at its upper end and a wrist pin housing 5 at its lower end. A combined eccentric and cam shaft 6 is provided which is mounted in any approved manner in bearings (not shown) and which carries an eccentric 7 about which is a strap 8 having a connecting rod 9 through which the wrist pin 10 passes.

A needle bar 11 is mounted on the needle bar support 4 by means of lugs 12 and pivot pin 13, a rocker arm being extended from a lug 12, to the end of which arm a connecting rod 36 is pivoted as at 39. An arm 15 is secured to the shaft 3 and is provided with a slot 16 to receive the tongue arm pin 29 that is carried by a tongue arm 28 later again referred to.

The needle-carrying lead 17 is secured to the needle bar 11 in any desired way. The needle, which constitutes the important part of the present invention, is best shown in Figs. 1, 2 and 3, by reference to which it will be seen that the needle comprises a base 18 that is mounted in the lead 17, a shank 19 and a hook 20. The shank 19 and part of the hook are longitudinally grooved, as at 22, to receive the tongue or blade. The tongue or blade comprises a base 23, a shank 24 and a flexible and resilient portion 26, the latter lying within the groove 22. When the tongue is within the needle (Fig. 1) it is entirely concealed within the needle and this is preferably the normal position of the tongue. The end 27 of the tongue is preferably anchored to the needle by welding or other suitable means. The tongue is provided with a recess 25*a* to fit the point 21 of the hook of the needle at times to close the thread passage of the needle as will more fully appear later.

By virtue of the construction of the needle as just described it will be seen that the portion of the hook 20 at the bend of the hook can be made heavier than the bend in a spring bearded needle and hence the portion of the needle most likely to break is reinforced and strengthened.

In order to operate the needle and tongue, to close and open the thread passage of the hook at the proper time in a knitting cycle, I may provide a leader cam 30 and a follower cam 31 on the shaft 6 to actuate a rocker arm 33 which is pivoted on a suitable rod or shaft 32 and is provided with cam engaging rollers 34 and 35 respectively. The arm 33 has an ear 37 to which the connecting rod 36 is pivoted as at 38.

The sinker 42 is mounted in any suitable way on the sinker bar 40 through the medium of the sinker lead 41.

In the diagrammatic figures of the drawings (Figs. 8 to 11) the usual swinging and racking thread guides 43, employed in tricot knitting machines, are shown.

Referring now particularly to Figs. 8 to 11 inclusive, it will be seen that with the parts positioned as shown in Figs. 4 and 8 the needle will be at the top or uppermost limit of its stroke and the tongue will be concealed in the needle thus leaving the thread passage between the point of the hook and the shank of the needle open; the needle will also be in vertical position. On leaving the position of Fig. 8 the needle and tongue remain in the same relative position as in Fig. 8, both moving vertically downward. On leaving the position of Fig. 9 the cam 30 begins to tilt the needle, the movement of the needle now being



a combined downward and tilting motion. As the needle begins to tilt the tongue base begins to leave the needle groove to close the thread passage of the needle and by the time the parts reach the position of Fig. 11, i. e., before the point of the needle reaches the loop that is around the shank of the needle, the passage will have been fully closed so that as the needle passes from the position of Fig. 11 to the position of Fig. 6 (the lowest position) the needle will knock-over. On passing from the position of Fig. 6 to the position of Fig. 7 the needle will be rocked back to the vertical position again and will remain in that position until the needle is again at the upper limit of its stroke, Fig. 8. It should of course be understood that the cams 30 and 31 will be properly shaped to effect the desired movements of the needle when operating in conjunction with the eccentric 7.

When the needle is to be used in machines employing stationary thread guides the cams will be shaped to tilt the needle to the proper degree and at the proper times to pick up the thread before closing the thread passage and to close that passage as soon as the point of the needle enters the sinker and keep it closed until the needle knocks over.

In Fig. 12 I have shown the tongue anchored to the needle by means of a pivot pin 44. When so constructed the portion 26*b* of the tongue as well as the shank 24*b* may be made approximately rigid, instead of springy or flexible, if desired.

In Fig. 12 those parts which bear the reference numerals 20*b*, 21*b*, 22*b* and 25*b*, respectively, may be of like construction to the parts 20, 21, 22 and 25, respectively, shown in the preceding figures.

From the foregoing description taken in connection with the accompanying drawings it is thought the construction, operation and advantages of my invention will be clear to those skilled in the art to which it appertains.

What I claim is:

1. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a base, a shank and a hook-closing portion, the latter being anchored within the hook, the shank of the tongue lying adjacent the shank of the needle while the thread passage of the needle is open.

2. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a longitudinally grooved shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a base, a shank lying within the groove of the needle and a hook-closing portion anchored to the needle within the hook and normally positioned to leave the thread passage open and adapted, when the tongue and hook bases are moved apart, to close the thread passage of the hook.

3. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a grooved shank and a hook the point of which lies spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within the hook and is normally out of contact with the hook so as to leave the thread passage normally open, the other end

of which tongue lies adjacent the base of the needle, that portion of the tongue which lies within the hook being adapted to close and open, respectively, the thread passage accordingly as said other end of the tongue is moved away from and toward the base of the needle.

4. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a grooved shank and a hook the point of which lies spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within the hook, the other end of which lies adjacent the base of the needle, that portion of the tongue which lies within the hook being adapted to close and open, respectively, the thread passage accordingly as said other end of the tongue is moved away from and toward the base of the needle, the needle and that portion of the tongue between the hook and the base of the needle being approximately rigid while that portion of the tongue which lies within the hook is flexible.

5. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a grooved shank and a hook the point of which lies spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within the hook, the other end of which lies adjacent the base of the needle, that portion of the tongue which lies within the hook being adapted to close and open, respectively, the thread passage accordingly as said other end of the tongue is moved away from and toward the base of the needle, the needle and that portion of the tongue between the hook and the base of the needle being approximately rigid while that portion of the tongue which lies within the hook is springy.

6. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a grooved shank and a hook the point of which lies spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within the hook, the other end of which lies adjacent the base of the needle, that portion of the tongue which lies within the hook being adapted to close and open, respectively, the thread passage accordingly as said other end of the tongue is moved away from and toward the base of the needle, the needle and that portion of the tongue between the hook and the base of the needle being approximately rigid while that portion of the tongue which lies within the hook is flexible, the end of the tongue which lies within the hook of the needle being anchored to the needle.

7. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a grooved shank and a hook the point of which lies spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within the hook, the other end of which lies adjacent the base of the needle, that portion of the tongue which lies within the hook being adapted to close and open, respectively, the thread passage accordingly as said other end of the tongue is moved away from and toward the base of the needle, the needle and that portion of the tongue between the hook and the base of the needle being approximately rigid while that portion of the tongue which lies within the hook is springy, the end of the tongue which lies within the hook of the needle being anchored to the needle.



8. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a base, a shank and a hook-closing portion, the latter being anchored within the hook, the shank of the tongue lying adjacent the shank of the needle while the thread passage of the needle is open; and means for effecting movement between the bases of the tongue and needle to close and open, alternately, the thread passage of the hook.

9. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a pipe; a bearing bracket mounted on said pipe and having a shaft bearing; a shaft longitudinally movably mounted in said bearing; means for reciprocating said shaft; a needle bar mounted on said shaft; a needle comprising a base, a shank and a hook, the point of which hook is spaced from the shank a distance sufficient to provide a thread passage, said needle being mounted on said needle bar; a tongue having a base, a shank and a portion lying within the hook of the needle and provided with a thread-passage-closing portion; a tongue arm to which said tongue is secured, said tongue arm having a guide pin; a slotted arm carried by said shaft and having a slot to receive said guide pin; and means to effect movement between said needle and tongue as the needle and tongue are moved with said shaft to effect a closing and opening of said thread passage at times.

10. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a pipe; a bearing bracket mounted on said pipe and having a shaft bearing; a shaft longitudinally movably mounted in said bearing; means for reciprocating said shaft; a needle bar pivoted on said shaft; a needle comprising a base, a shank and a hook, the point of which hook is spaced from the shank a distance sufficient to provide a thread passage, said needle being mounted on said needle bar; a tongue having a base, a shank and a portion lying within the hook of the needle and provided with a thread-passage-closing portion; a tongue arm to which said tongue is secured, said tongue arm having a guide pin; a slotted arm rigidly mounted on said shaft and having a slot to receive said guide pin; and means for rocking said needle bar on its pivot as said shaft reciprocates to cause said tongue to close and open, alternately, said thread passage for purposes described.

11. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a pipe; a bearing bracket mounted on said pipe and having a shaft bearing; a shaft longitudinally movably mounted in said bearing; means for reciprocating said shaft; a needle bar pivoted on said shaft; a needle comprising a base, a shank and a hook, the point of which hook is spaced from the shank a distance sufficient to provide a thread passage, said needle being mounted on said needle bar; a tongue having a base, a shank and a portion lying within the hook of the needle and provided with a thread-passage-closing portion; a tongue arm to which said tongue is secured, said tongue arm having a guide pin; a slotted arm rigidly

mounted on said shaft and having a slot to receive said guide pin; and means for rocking said needle bar on its pivot as said shaft reciprocates to cause said tongue to close and open, alternately, said thread passage for purposes described, said last named means including a rocker arm secured to said needle bar, a second rocker arm, a connecting rod between said rocker arms, leader and follower cams, and cam rollers on said second rocker arm for engaging the leader and follower cams respectively.

12. In a knitting machine which employs knitting needles, sinkers and thread guides, the improvement which includes: a needle having a base, a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a base, a shank and a hook-closing portion the latter being pivotally anchored within the hook, the shank of the tongue lying adjacent the shank of the needle while the thread passage of the needle is open.

13. In a knitting machine, the improvement which includes; a needle having a base, a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a shank and a hook-closing portion, the shank of the tongue being bodily movable toward and from the needle shank; and means to move the shank of the tongue bodily toward and from the shank of the needle to open and close the thread passage accordingly as the shank of the tongue is moved in one direction or the other.



14. In a knitting machine, the improvement which includes; a needle having a base, a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue, one end of which lies within and is anchored to the hook, the other end of which lies adjacent the base of the needle; and means for causing relative movement between the shanks of the tongue and the needle to open and close the thread passage.

15. A knitting machine needle having a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage; a tongue having a shank and a hook-closing portion, one end of said tongue being anchored in the hook, said tongue being adapted to lie adjacent the shank of the hook when said thread passage is open and having a recess to receive the point of the hook when the thread passage is closed.

16. In a knitting machine; a fixedly located bearing; a shaft longitudinally movable in said bearing; means for reciprocating said shaft; a needle bar pivotally mounted on said shaft; a needle carried by said needle bar and having a shank and a hook, the point of the hook being spaced from the shank a distance sufficient to provide a thread passage, a tongue carried by said needle; and means for effecting relative movement between said needle and said tongue for closing and opening said thread passage while said shaft is being reciprocated.

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