United States Patent

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Italy,
No. 15158-A/68

[54] **NEEDLE BAR FOR HOSIERY LINKING MACHINES**
4 Claims, Drawing Figs.

[52] U.S. Cl. 112/25, 112/226
[51] Int. Cl. D05b 7/00
[50] Field of Search 112/225, 227, 25, 27

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ABSTRACT: A needle-bar for linking machines (loopers) for hosiery is disclosed, in which the needle is mounted eccentrically with respect to the axis of said needle-bar. Means are further provided for varying the eccentricity of the needle with respect to the needle-bar, care being taken in any case that the axes of the needle and the needle-bar are rigorously parallel to one another. The advantage afforded by the novel eccentric needle bar is that, whenever the needle bar is to receive, in addition to its conventional reciprocal motion, also a partial alternating rotation about its own axis, the control mechanisms which govern the movement of the needle bar can be considerably simplified. Thus, the reliability of the machine and its working speed are considerably improved.

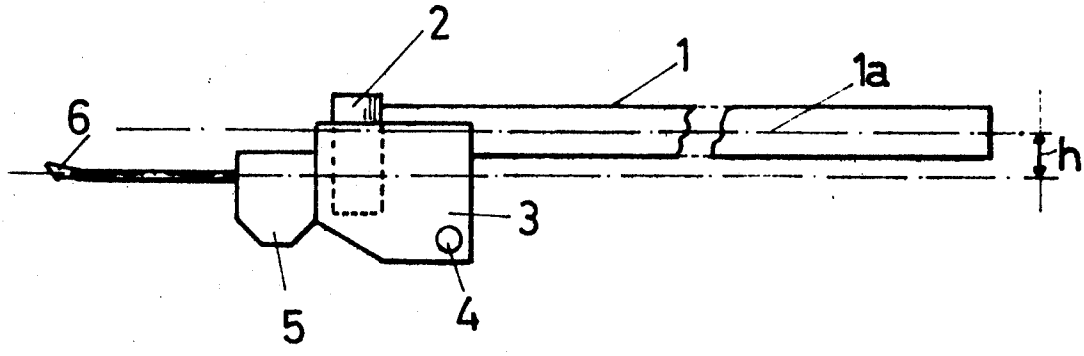


FIG.1

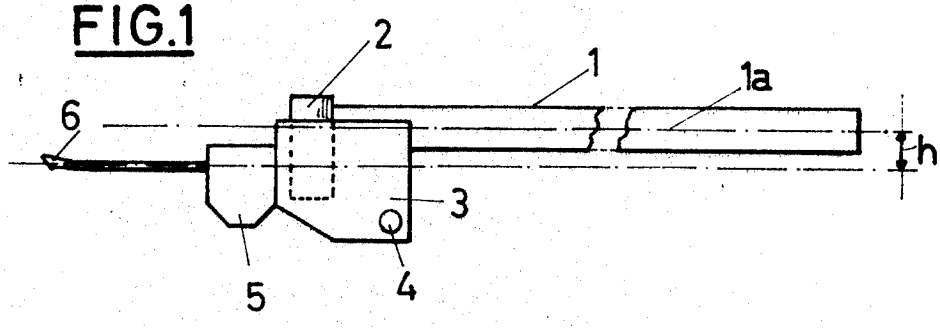


FIG.2

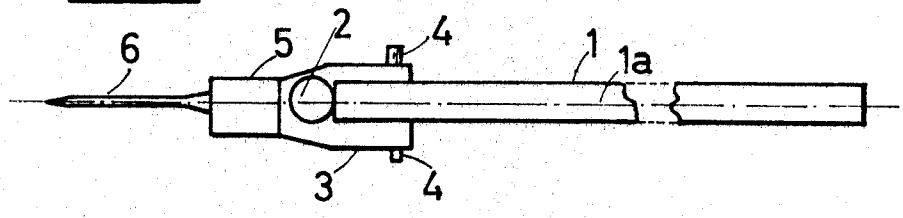
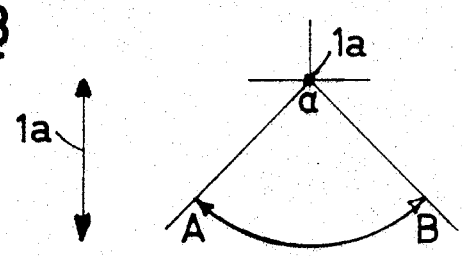


FIG.3



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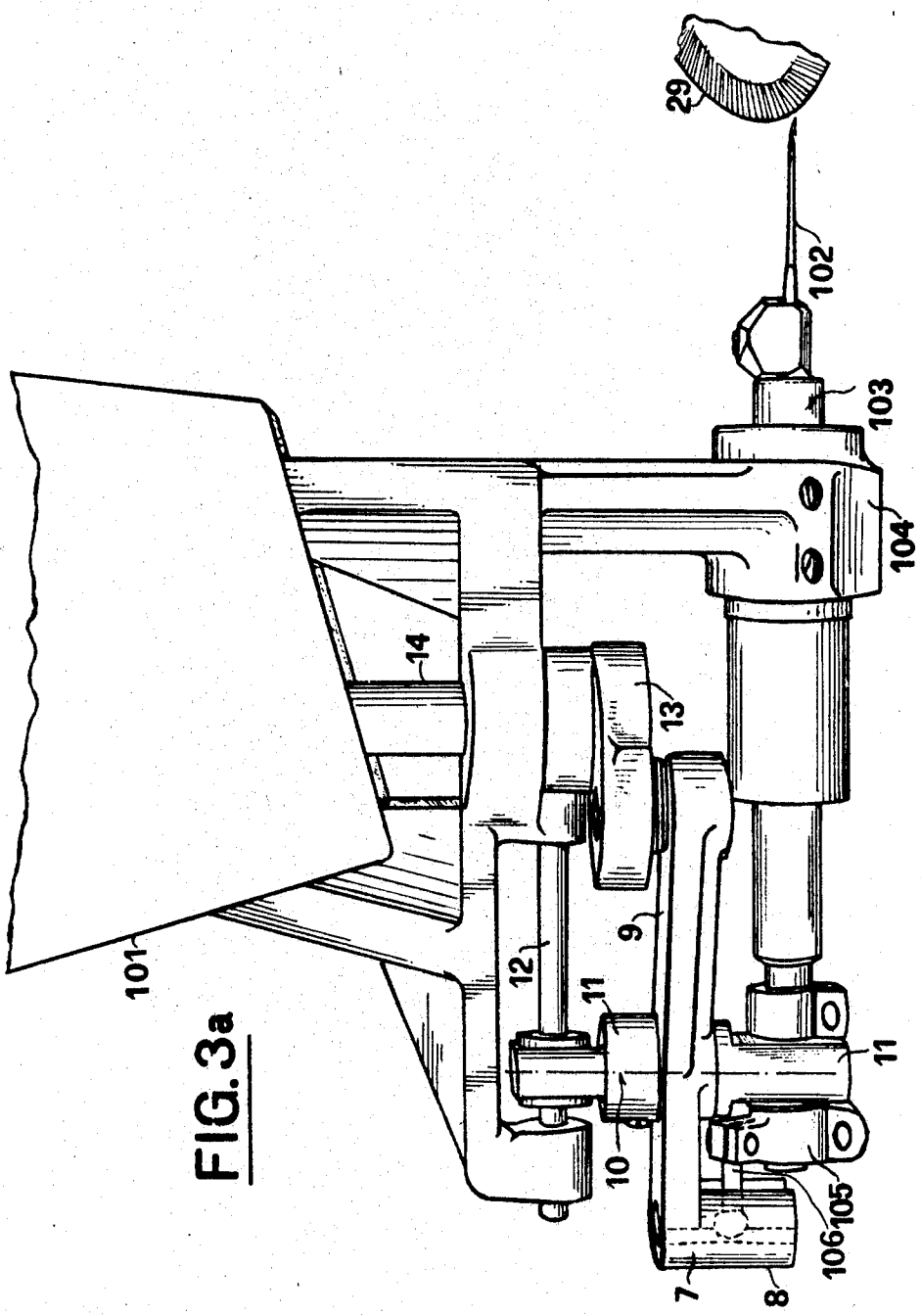

FIG. 3a

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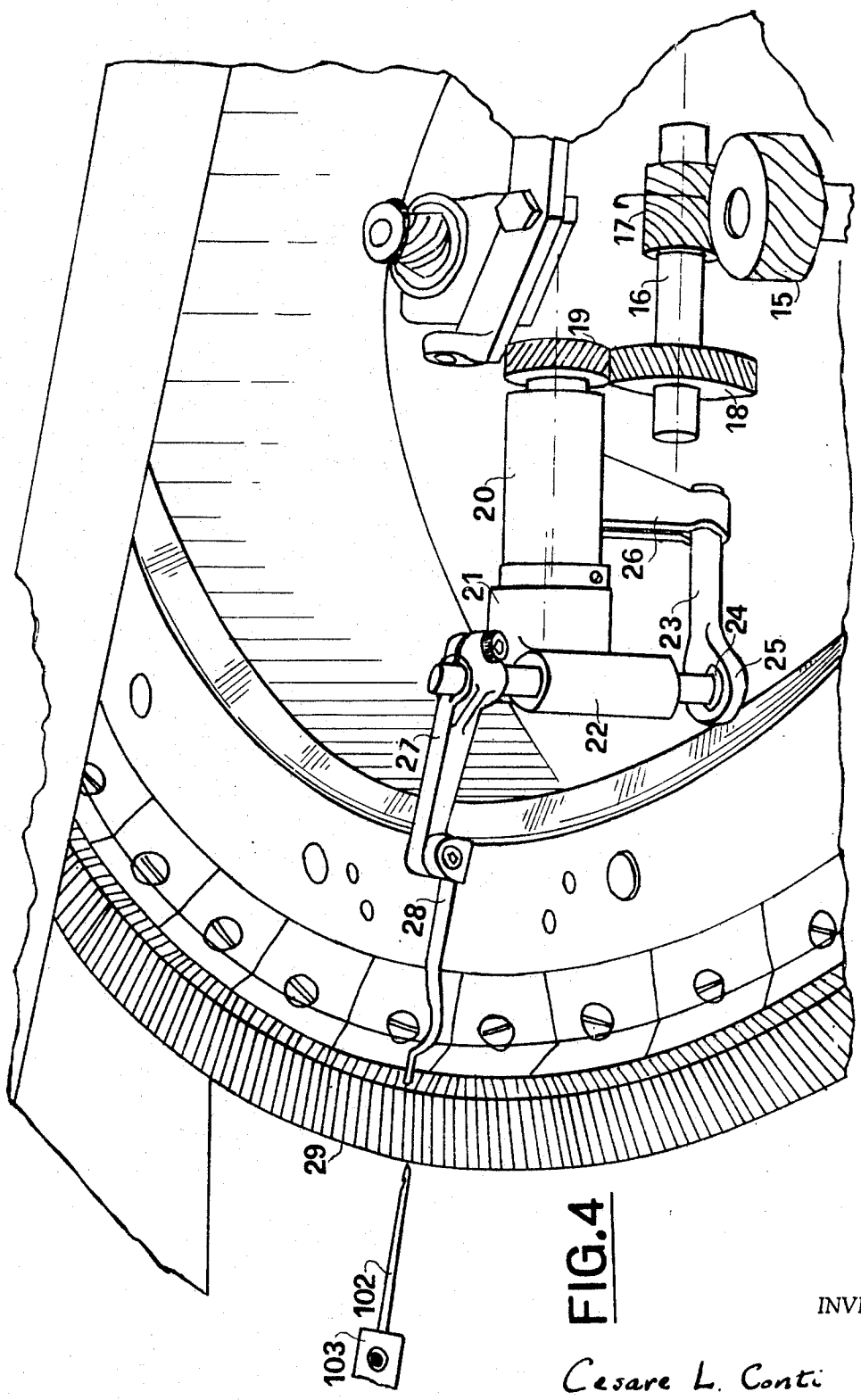

FIG.4

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U.S. PATENT 3,522,780

NEEDLE BAR FOR HOSIERY LINKING MACHINES

FIELD OF THE INVENTION

This invention relates to a constructional arrangement of needle bars, especially for hosiery linking machines.

BRIEF SURVEY OF THE PRIOR ART

It is known long since that linking machines in general possess, as one of their essential members for formation of the kind of stitch selected according to the work to be completed, a needle bar intended for firmly supporting the needle and imparting thereto any desired movement by the agency of appropriate mechanisms: these latter will no longer be cited in detail since they are well known to those skilled in the art and, on the other hand, they do not form an integral part of the subject invention.

It is likewise known that linking machines of a particular kind are in use, wherein the needle bar not only receives the conventional movements, but is to perform a more complex movement, that is, a movement of alternating partial rotation about its own axis. An example of a needle bar which receives such an alternating angularly limited axial rotation movement is the machine disclosed and claimed in the copending U.S. Patent Application Serial No. **610,948** filed January **23, 1967** by the same Applicant, now patent No. **3,476,064**.

Briefly summarizing the foregoing, the principal object of this invention is to simplify to the utmost the control mechanisms in all the cases in which the needle bar of a linking machine is to receive, in addition to its usual rectilinear reciprocation, a movement perpendicular thereto for achieving the cooperation between the needle bar and the impaling pins for the work: the latter movement is conventionally performed at present by means of a cam and appropriate crank mechanisms: these latter can now be dispensed with in an advantageous manner by resorting to the teachings of the present invention, the result being a considerable simplification of the construction of the machine, which also entails a remarkable increase of the speed of operation thereof.

BRIEF SUMMARY OF THE INVENTION

Broadly, according to the present invention, the needle is eccentrically mounted with respect to the needle bar, means being preferably, but not necessarily, provided for varying, either upon assembly or during the operation of the machine, said eccentricity within a certain range, the needle bar further receiving a movement of partial alternating rotation about its own axis.

It can easily be understood, at this stage, that the invention can be put into practice by extremely simple and cheap means.

The means provided for varying the eccentricity of the needle with respect to the needle bar are many; thus, an infinity of these means can be envisaged without departing from the spirit and scope of this invention; what actually matters is that such an eccentricity exists and, preferably, that it be adjustable. In certain cases, the needle-bar and needle assembly can be provided beforehand with a fixed eccentricity, said fixed eccentricity being selected to fulfil certain particular requirements, for example for the production of a certain class of hosiery articles.

The means provided for imparting to the needle bar the above cited alternating partial rotary movement about its own axis are also many: by way of example, see the linking machine disclosed and claimed in U.S. Patent Application Serial No. **610,948** cited hereinabove.

DETAILED DESCRIPTION OF THE INVENTION

The invention will now be illustrated and described in connection with an exemplary embodiment thereof, it being understood that any other mechanical means capable of varying the eccentricity of the needle with respect to the longitudinal

center line of the needle bar within a preselected range (in practice a few millimeters or even a fraction of a millimeter in certain cases), in conjunction with any other means adapted to impart to the needle bar a movement of partial alternating rotation (i.e. angular oscillation) about its axis, embodies the present invention.

In addition, a practical example will be given of a manner in which the present invention can be applied to a hosiery linking machine.

The above cited exemplary embodiment and practical application of the invention are shown in detail in the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of a needle bar having an eccentric needle according to this invention.

FIGURE 2 is a plan view of the needle bar shown in **FIG.** 1.

FIGURE 3 is a diagrammatical showing of the horizontal reciprocation of the needle bar and its angular swinging motion on a vertical plane which is perpendicular to the axis of the needle bar.

FIGURE 3a is a perspective view of a stitch-formation mechanism which utilized an eccentric-needle needle-bar according to this invention.

FIGURE 4 is a perspective view of a mechanical unit which imparts an elliptical or oval movement to a thread-guide of a hosiery linking machine.

The arrangement shown in **FIGURE** 1 discloses a needle bar, **1**, mounted in a clamp **3**. Said clamp can be tightened with a threaded-pin tightening device having a threaded pin **4**, whereas a small cylinder **2** acts as an abutment for the front end (as viewed in **FIG.** 1) of the needle bar **1**. A needle, **6**, is integrally mounted in a needle-carrying block **5** (the needle being held in fixed position, for example, by a screw which has not been shown to simplify the drawing), and said needle-carrying block is firmly fastened to the clamp **3**.

It is apparent that, by shifting the assembly comprising the clamp **3**, the block **2** and the needle bar **1**, the eccentricity, h, that is the distance between the axis of the needle **6** and the axis of the needle-bar **1** can also be varied. The same arrangement of component parts can be seen, in plan view, in **FIG.** 2: in this drawing, the eccentricity, h, cannot be seen any more, since it has been assumed, in this case, that said eccentricity is referred to a vertical plane containing both the axes of the needle and the needle-bar when these two members are in their starting or inactive position. Said geometrical assumption has been made for simplification only. Otherwise, what has been said in connection with **FIG.** 1 holds good also for **FIG.** 2.

It should be noticed, also, that the exemplary embodiment depicted in **FIGS.** 1 and 2 of the accompanying drawings is not to be construed as a limitation of the scope of the invention: as a matter of fact, the mechanical means adapted to vary the eccentricity of the needle with respect to the needle-bar can be selected among a wide variety: for example, instead of the combination clamp-block-needle bar, a needle-carrier can be provided, which is mounted on a small slide adapted to glide on ways integral with the front end of the needle bar, while a set screw, properly located, could serve to lock the whole assembly in the position which corresponds to the preselected eccentricity.

What actually matters, in practice, is that the eccentricity and the angle of partial alternating rotation, alpha (**FIG.** 3) in combination, correspond to those values which allow the needle to stay in registry with the working pin.

FIGURE 3 clearly shows the movements imparted to the needle. More accurately, the line **1a**, the reference numeral being the same adopted for the longitudinal center line of the needle bar **1**, denotes the reciprocal movement of the needle, whereas the sector having the center angle alpha defines an arc AB which is the arcuate path on which the needle point travels during a partial alternating half-rotation, said path corresponding to one half of the inter-pin gap or machine gauge.

The center angle alpha is generally in the order of magnitude of **90°**, said value being, however, given by way of suggestion only.

To show the advantages of the invention in a simple manner, it will be enough to say that the conventional needle-synchronizing mechanism with return spring, which is commonly adopted to effect the movement of vertical oscillation of the needle can be totally dispensed with if the inventive device is adopted: in addition to that, the possibility is afforded of effecting an adjustment which could not be obtained with the prior art arrangements.

A PRACTICAL EXAMPLE OF APPLICATION OF THE INVENTION

Referring now to the example shown in **FIGS.** 3a and 4 hereof, a practical application of the inventive device to a linking machine in which the needle is mounted externally to the pin dial, will be described. In order that overcrowding of the drawings may be avoided and also that parts unnecessary to the understanding of the invention may be shown, only the end portion of the arm of the linking machine has been shown: the dial has been shown only diagrammatically, but in a manner which is largely sufficient to give a clear understanding of the invention.

The head **101** of the linking machine arm carries the stitch-forming mechanism. Said device comprises a needle, **102**, eccentrically mounted on its needle-bar, **103**. It will be observed that the longitudinal center lines of the needle and of the needle-bar, respectively, are not coincident, but they must be rigorously parallel to one another, otherwise the loop-stitch forming movement would be wholly irregular. The needle bar **103** is both slidably and rotatably supported within a supporting member **104** which, as shown in the drawing, can be, for example, a mere extension of the head **101**. At the left end, as viewed in **FIG.** 3a , of the needle bar **103**, is mounted a crank **105** which imparts the rotary movement of the needle bar **103** about its axis. The crank **105** carries, perpendicularly thereto, an end pin **106** having a spherical extension which is shown in phantom lines in **FIG** 3a. As shown in the drawing, the pin **106** is mounted on the free end of the crank **105**. The spherical end of the pin **106** slides within a longitudinal vertical groove **7** formed in a small block **8**. The block **8** is mounted at the end of a lever **9**. The lever **9** is pivotally mounted about an intermediate point by means of a through-pin **10** (not shown in the drawing, which only indicates the axis of said pin), and the pin **10** is downwardly extended until it is received by a block **11**. At the top, the through-pin **10** is received by a second block **11**, which is reciprocable along a cylindrical guide **12**. Said cylindrical guide **12** is affixed, at its ends, to the head **101**, as shown in the drawings. At its end away from the end which carries the grooved block **8**, the lever **9** is connected to one end of a crank **13**. The other end of the crank **13** is integral with an arbor **14**, which receives a continuous rotary drive from conventional drive-transfer members (e.g. bevel gears) actuated by the usual motor of the linking machine.

By examining **FIGURE** 3a again, the operation of the device will become fully apparent: as a matter of fact, the arbor **14**, continually driven by the machine motor, rotates the crank **13** which, in turn, oscillates lever **7**. The latter, pivoted at **10**, is rotated about its own pin and also receives a reciprocal motion whose stroke is defined by the length of the cylindrical guide **12**. This stroke defines the path of reciprocal motion of the needle-bar **103**. As a matter of fact, the pin of the lever **9** is extended downwardly into block **11**. The rotary movement of the needle-bar about its own axis is effected by the grooved block **8**, placed at the free end of the lever **9**. The mechanical linkage between the needle-bar **3** and the lever **9** is through pin **106**, whose spherical extension is perpendicular to crank **105**. It can now be easily understood that an oscillation of the lever **9** causes an oscillatory movement of the crank **105** and thus also of the needle bar **103**.

The eccentric mounting of the needle on its needle bar eliminates the mechanism and the return spring which have heretofore been required to impart the vertical movement to transfer the needle from one impaling pin to the next one. The advantage achieved thereby is especially conspicuous in linking machines having the needle mounted outside the pin dial. As is known, the needle synchronization mechanism can be mounted, for a linking machine having an internal needle, in the cup-shaped space placed internally of the pin dial, whereas the mounting of such a synchronization mechanism would be extremely cumbersome for a linking machine having the needle external to the pin dial, since, in such a case, a rather intricate and costly linkage should be provided.

Coming now to **FIGURE** 4 of the accompanying drawings, a device has been shown which is intended to impart to the thread feeding and guiding unit the elliptical movement which is necessary to form the loop stitch in cooperation with the movement of the needle.

Internally of the pin dial, **29**, the thread feeding and guiding mechanism is mounted. It comprises, in the order given, and from the right to the left as viewed in **FIG.** 4, a gear pair **15, 17** by which the drive received from the motor of the machine, is transferred to the gear **17** and, therefrom, to the shaft **16** to which the latter gear is keyed. To the shaft **16** is keyed a gear **18** meshing with the gear **19**. The gear **18** has twice the number of teeth of the gear **19**, so that the relative gear ratio is **2** to **1**. The shaft of the gear **19** (a small portion of it can be seen) is received by a cylindrical supporting member **20** and, at the end of the shaft which rotates in **20**, there is an eccentric **21**, mounted internally and thus not shown in the drawings. The internal eccentric **21** transfers its drive to the block **22**, which carries a cylindrical rod **23**. The lower end of the rod **23** cooperates with a balljoint **24** mounted at the end of an arm **25**, the latter protruding from a bracket **26**. At the upper end of the rod **23** is removably and adjustably mounted an arm **27** which is extended to form the thread-guide proper **28**. As viewed in the drawing, by virtue of the rotation of the gears **15, 16, 18, 19** and of the internal eccentric **21**, as well of the universal joint arrangement of the rod **23** (as guided by the block **22**, it can readily be seen that the tip of the thread-guide **28** goes over an oval path whose major axis is nearly horizontal. This movement, in cooperation with the movements of the needle, originates the desired loop stitch.

It should be observed that, on account of the considerable constructional simplification made possible by the invention, which has permitted dispensing with several component parts, a linking machine equipped with the inventive device as now described is capable of attaining extremely high speeds, which are in any case higher than the working speeds obtainable with the conventional hosiery linking machines. The elimination of a few component parts has led not only to the immediate consequence of first-cost reduction, but also to the elimination of undesirable inertia forces and vibrations.

I claim:

1. In a hosiery linking machine

a needle bar mounted for oscillation and for rectilinear reciprocation in the direction of the axis of oscillation of said bar,

a needle mounted on said bar to extend parallel to but be eccentric of the axis of oscillation of said bar, and

means for imparting reciprocation to said bar in the direction of said axis and for simultaneously effecting oscillation of said bar about said axis.

2. In a hosiery linking machine as claimed in claim **1**, means for adjusting the eccentricity of said needle relative to said axis.

3. A hosiery linking machine as claimed in claim **2**, wherein the means for varying the eccentricity of said needle comprises a block abutting the front end of said needle bar, a clamp for releasably securing said block to said bar, and a block in which said needle is mounted to project forwardly parallel to the axis of said bar, said clamp being releasable to adjust the amount of offset of said needle from the axis of oscillation of said bar.

4. A hosiery linking machine as claimed in claim 2, wherein the means for adjusting the eccentricity of the needle comprises two members which are slidable with respect to one another, one of which is fixed to a member carrying said needle, and the other of which is fixed to said needle bar, and screw means for fastening said two members to one another with the needle in the desired position eccentric of the axis of oscillation of said bar.