R. W. STEED.

TOY KNITTING DEVICE.

APPLICATION FILED APR. 12, 1917.

1,291,226.

Patented Jan. 14, 1919.

2 SHEETS—SHEET 1.

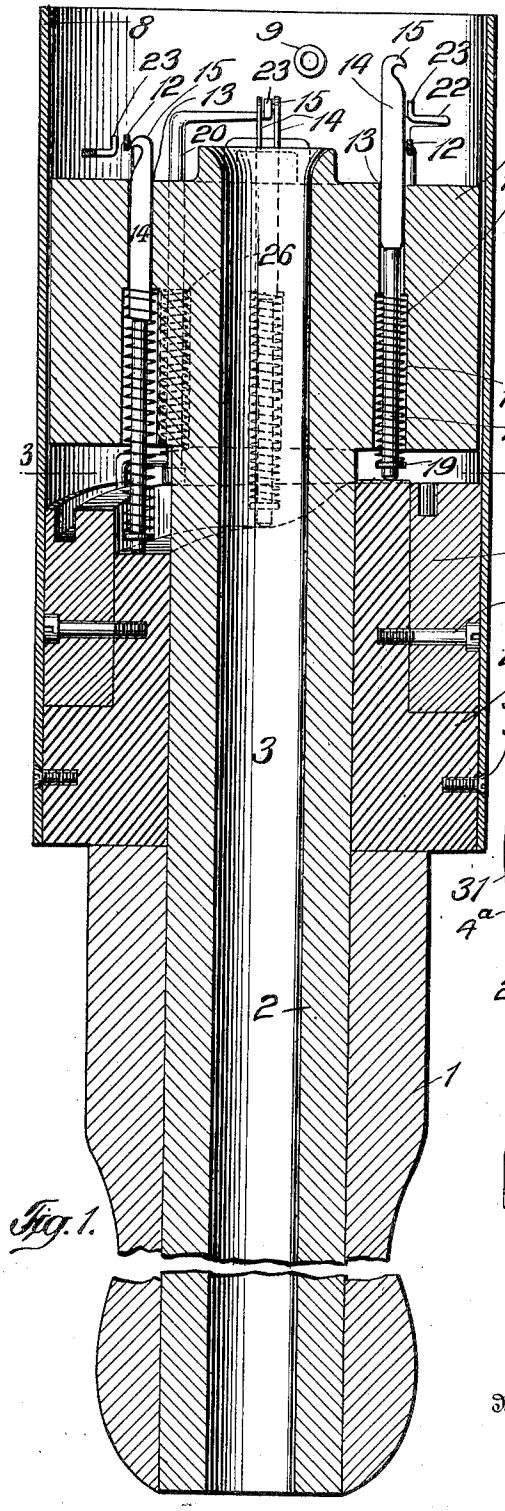


Fig. 1.

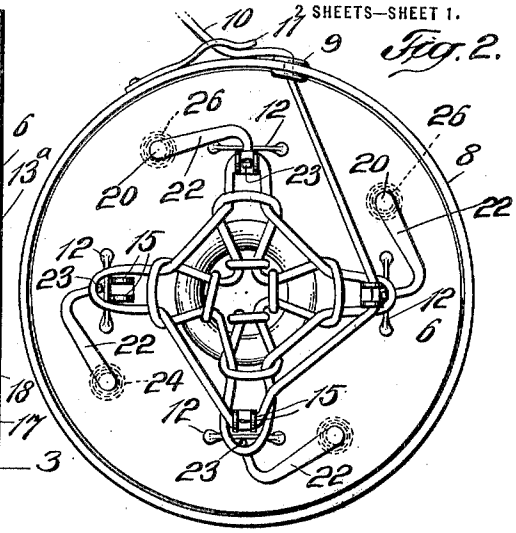


Fig. 2.

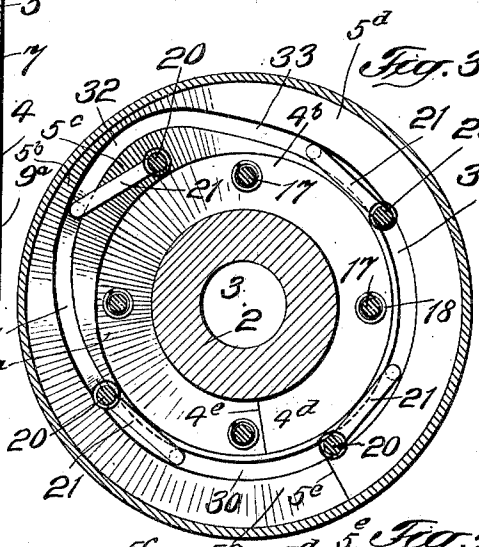


Fig. 3.

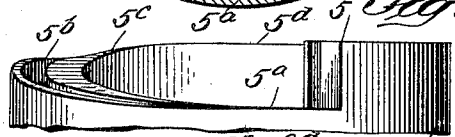


Fig. 4.

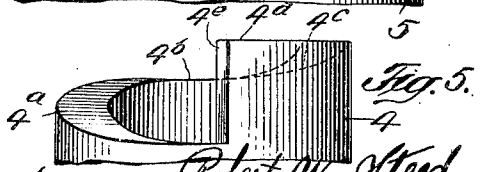


Fig. 5.

Witnesses:

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2 SHEETS—SHEET 2.

Fig. 9.

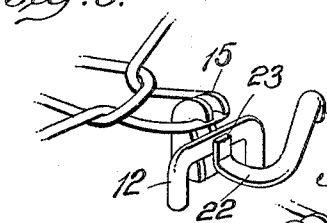


Fig. 10.

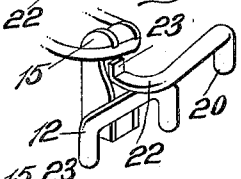


Fig. 11.

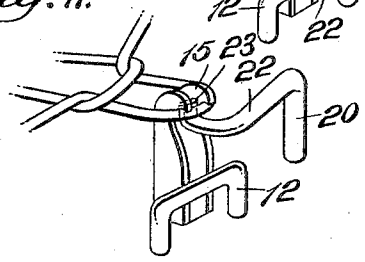


Fig. 12.

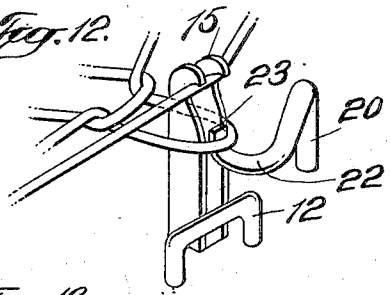


Fig. 13.

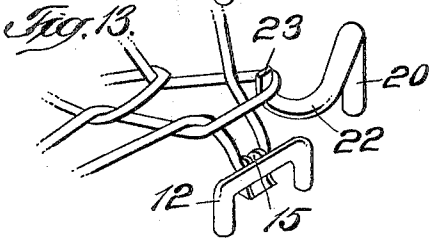


Fig. 14.

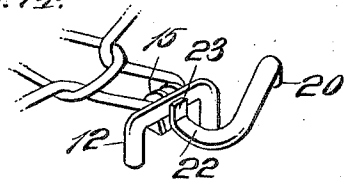


Fig. 6.

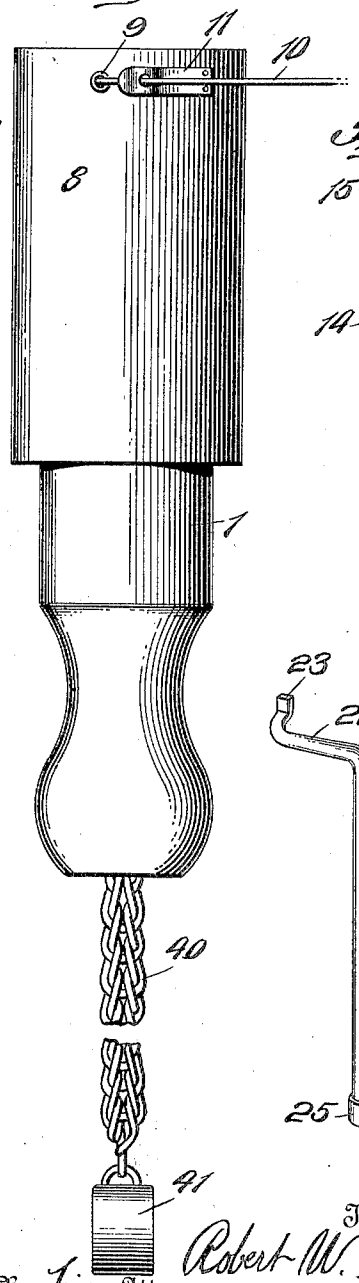


Fig. 7.

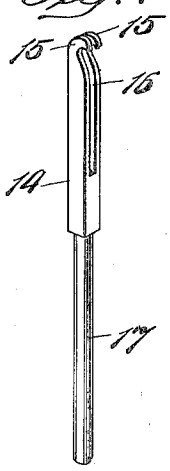
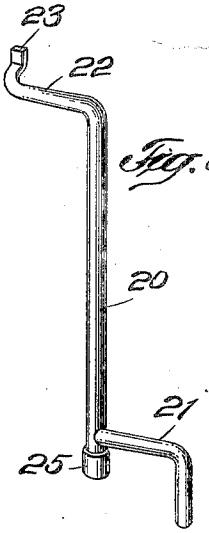


Fig. 8.



Inventor

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TOY KNITTING DEVICE.

1,291,226. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed April 12, 1917. Serial No. 161,395.

To all whom it may concern:

Be it known that I, ROBERT W. STEED, a citizen of the United States, and resident of Maplewood, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Toy Knitting Devices, of which the following is a specification, reference being had therein to the accompanying drawing.

My present invention refers to a novel and ingenious toy device for performing a knitting or similar operation, the same being a manually operated mechanical toy by the use of which children and others may be able to manipulate needles and other implements in a positive and certain way, so that they can thereby interweave or knit together strands or threads in such a way as to produce a tubular cord or any other equivalent article or fabric for which the needles may be properly set. The invention has for its object the production of a simple, cheap, and efficient toy or other knitting machine, and it consists essentially in the construction, arrangement, and combination of the various parts, substantially as will be hereinafter described and claimed.

In the accompanying drawing illustrating my invention:

Figure 1 is a vertical section of my improved knitting toy;

Fig. 2 is a top plan view of the same;

Fig. 3 is a horizontal plan on the line 3, 3 of Fig. 1;

Fig. 4 is a detached partial side elevation of the outer channeled cam controlling the movements of the outer series of needles;

Fig. 5 is a similar side view of the inner cam which controls the movements of the inner series of needles;

Fig. 6 is an outside elevational view of the entire device;

Fig. 7 is a detail perspective view of one of the inner needles;

Fig. 8 is a detail perspective view of one of the outer needles;

Fig. 9 is a perspective view of a few stitches of knitted fabric and shows one of the inner and one of the outer needles in juxtaposition to each other, and in the position which they individually assume at a certain point in the formation of a stitch;

Fig. 10 is a similar perspective view showing the parts in another position during the formation of a stitch;

Fig. 11 is a similar perspective view showing the parts in a further position that they occupy during the formation of a stitch;

Figs. 12 and 13 are similar perspective views showing the progress in the operation of making a stitch;

Fig. 14 similarly represents the relation of the parts at the time of the completion of the stitch.

Similar characters of reference designate corresponding parts throughout the different figures of the drawing.

This knitting device is intended to be held easily in the hand, so that it may be manually operated by a child or other person; and its frame comprises essentially a handle 1 consisting of a tubular member which is secured to or made as a part of an inner elongated member 2 having a central passage 3 and a cylindrical head 6, which serves as a needle carrier. Surrounding the inner tubular member 2, and located between the end of the handle 1 and the head 6 is a concentric loosely-supported cylindrical block 4, the upper edge of which provides an irregularly horizontal cam track, said block 4 being rabbeted exteriorly to receive and support a cam shaped annulus 5 having on its upper edge an irregularly horizontal cam track formed with a cam groove, said annulus or ring 5 being firmly secured by screws, bolts, or other similar devices 7 to the cam block 4. Also, as another part of the general frame combination, I utilize an open-ended cylindrical casing 8 which is secured to the block 4 by screws 9^a or similar devices, and which extends upward alongside of the cylindrical head 6 but at a short distance therefrom so as to leave room enough between them to allow the head to freely revolve inside of casing 8, and casing 8 also extends above said head 6 so as to protect the needles which operate in and above said head 6, it being noted that the upper end of the cylinder 8 affords room therein for the knitting operation, as shown in Figs. 1 and 2, and the wall thereof near the top is provided with a perforation 9 through which the yarn or thread 10 enters and is directed to the knitting needles, the exterior of the casing 8 being preferably provided with a perforated tension device 11 for holding the yarn 10 in tension just outside of the perforation 9.

It will thus be seen that by grasping the

upper portion of the device, that is to say, the casing 8, in one hand, and with the other hand manually rotating the handle 1, which carries with it the tubular member 2, carrier head 6, and the needles, said needles will have the proper movements imparted thereto by the cams for performing the designed knitting operations. It will also be evident that the handle 1 may be held stationary and the casing 8 rotated provided the mechanical details are arranged for this reversion.

The head 6 is provided on its top surface with a plurality of fixed projections or staples 12 which in the present example of the invention are preferably curved pieces with two prongs which are driven fixedly into the top of the head 6, and in the present example there are four of them, although I do not wish to be limited to any specific number. Adjacent to each of the fixed projections 12, the head 6 is provided with a vertical passage 13 in which reciprocates a needle 14. There are thus in the present example four of the needles 14, one of which is shown in Fig. 7. It consists of a cleft upper portion whose bifurcated members are hook-shaped at 15 at the upper end and which leave a space 16 between them, while the lower end of each needle 14 is formed as a rod 17, around which is coiled a spring 18, the same being tensioned between a collar 19 on rod 17 and some suitable portion of the inner wall of the passage 13, it being noted that the lower end of said passage is enlarged at 13^a, so as to provide room to accommodate the spring 18. Further, it will be noted that the lower end of the rod shaped member 17 of the needles 14 is held by the spring 18 in close contact with the cam path on the upper end of the block 4, (see Figs. 1 and 5) so that during the rotation of the handle 1, or of the casing 8, one being held stationary and the other rotating in relation to it, it will be evident that the various needles 14 will be reciprocated and will have their movements controlled by the springs and the cam. These needles 14 will further be seen to occupy positions immediately behind the fixed projections 12 on the side of the latter toward the center of the machine. Needles 14 are similar to crochet needles and are preferably square or angular as are also the passages 18 to keep them from revolving.

On the other side of each fixed projection 12 is another needle 20, one of them being shown in perspective in Fig. 8, where it is seen to consist of a vertical rod having an angular projection 21 at its lower end and another angular projection 22 at its upper end, which latter extension 22 terminates in a vertical tip 23, which constitutes the end of the needle and which has a movement in relation to the fixed projections 12 and the vertically-reciprocatory needles 14, such as I shall presently describe. These needles 20 occupy vertical passages 24 in the head 6, and their upper tips 23, as well as the angular projections 22 which carry said tips vibrate horizontally on the side of the fixed projections 12 opposite to where the hooked needles 14 are located; while the lower angular projections 21 of the needles 20 are below the carrier head 6 and in the space between said head and blocks 4 and 5, and said angular projections 21 engage the cam groove of the cam annulus 5 while the lower end 25 of the needle 20 rides upon the cam track of said cam annulus, all as clearly indicated in Figs. 1 and 4.

The angular projection 21 is preferably bent at right angles, as seen in Fig. 8, so that its bottom vertical end will engage the cam groove in member 5 while the lower end 25 of the needle proper 20 will be adapted to ride upon the top cam face of said member, but it will be obvious that these parts may be shaped in various ways provided only they are so related to the cam device that the latter will cause the needle to have a vertical reciprocation by virtue of its contact with the cam face and also a lateral oscillation or vibration by virtue of the engagement of the lower end thereof with the cam groove. During the rotation of the handle 1, with the casing held stationary, or the rotation of the casing 8 with the handle 1 held stationary, it will be evident that these outer needles 20, which are equal in number to the needles 14 and the fixed projections 12, will be successively operated by their engagement with the cam devices, as already suggested, and they will be vertically reciprocated and pivotally turned and caused to occupy different positions so as to bring about the desired results in the knitting of the yarn or thread, it being furthermore observed that each of the needles 20 is provided with a spring 26 similar to the spring 18 and having a similar effect of holding the lower portion of the needle in contact with the cam which controls its reciprocatory movement and enables it to take the different required positions.

Referring next to the cam devices shown more fully in Figs. 3, 4 and 5, I will explain how these devices are shaped to provide the required results. The inner cam member 4 has its upper edge formed as a horizontally irregular path with different horizontal levels, as shown in Fig. 5, there being the arcual segment 4^a which is a gradually ascending path, the arc or segment 4^b which is a horizontal level, the gradually ascending arc or segment 4^c, and the upper horizontal level 4^d, which comes to an abrupt end at 4^e, where a vertical shoulder drops down for some little distance to the lowest point of the segment 4^a at its beginning.

On this path, therefore, with its different levels and connecting ascents the lower ends 17 of the inner pins 14 are in contact, so that by the revolution of the needle carrier these needles 17 are caused to rise and fall on the cam face. Next describing the outer cam 5 (see Figs. 3 and 4), it will be seen that its upper edge thereof provides a grooved cam path having different horizontal levels and connecting ascents, with the groove in the path being eccentric with reference to the axis of revolution of the cam 5 or the carrier 6. This upper edge of the cam member 5 has a gradually ascending arc or segment 5^a, which merges into a horizontal arc or segment 5^b, which in turn merges into a rising segment 5^c which in turn merges into the horizontal arc or segment 5^d, which terminates abruptly at 5^e where there is a substantial vertical drop directly down to the beginning of segment 5^a. The relative lengths of the segments 5^a, 5^b, 5^c and 5^d may vary for the purpose of accomplishing the best results, as may also the relative lengths of the corresponding cam segments 4^a, 4^b, 4^c, 4^d of cam 4. Furthermore the groove which runs from one end to the other of the whole path on the upper edge of cam 5 consists of an arc or segment 30 which is concentric with the axis of cam 5, a connecting arc or segment 31 which is eccentric and has a radius larger than the radius of the segment 30 and gradually increasing in length until the arc or segment 32 is reached, which is likewise eccentric, but which embraces a portion of increasing radius and also one of diminishing radius so that this segment 32 merges into the arc or segment 33 which is of gradually diminishing radius, and which merges into the arc or segment 34 which is concentric with the cam 5 and terminates at the shoulder 5^e. The groove sections or segments 30, 31, 32, 33 and 34 bear a general relation in position to the segments 5^a, 5^b, 5^c and 5^d of the horizontal cam path, but are not coterminus unless desired, as they have different functions to perform. As stated, the projecting angular vertical pins 21 belonging to the outer needles 20 operate within the cam groove consisting of segments 30, 31, 32, 33 and 34 while the enlarged lower ends 25 of the outer needles 20 operate upon the irregularly horizontal cam path 5 consisting of segments 5^a, 5^b, 5^c and 5^d.

As already stated the revolution of the needle carrying head 6 under the manipulation of the handle 1 causes both rows of needles to travel about in circular paths and the lower ends 17 of the inner needles 14 to travel upon the cam 4 while the lower ends of the outer row of needles 20 travel upon the cam 5. By reference to Fig. 3 it will be seen how the two cams 4 and 5 are related to each other, that is to say, how their several segmental portions are severally positioned relatively and it will be noticed that the shoulder 4^e is more or less in advance of the shoulder 5^e so that the needles riding on the cam 4 will each drop off the shoulder 4^e before the companion needle which is riding upon the cam 5 drops off the shoulder 5^e, this being so because the angular projection 21 on the needles 20 acts some little time after the release of the lower end of the needles 14; but obviously the relative position of the two shoulders 4^e and 5^e is not of so much importance as the relative location of the lower end of a particular needle 14 and the lower end of the angular projection 21 of a particular companion needle 20.

Thus it will be seen that the inner needles 14 after they begin to rise from their lowest position occupy two principal positions at different times, one of which may be called the half-elevated position, that when the lower end of the needle is traveling on the horizontal cam segment 4^b, and the other the high position, that when its lower end is traveling on the horizontal cam segment 4^d as also the various intermediate shifting positions, when the lower end of the needle is traveling on the inclined cam segment 4^a and that when it is traveling on the inclined cam segment 4^c. The lowest position of a needle 14 when its lower end is beginning to travel on the cam segment 4^a is shown in Figs. 1, 13, and 14. When it reaches the horizontal segment 4^b it is in the half-elevated position, as seen in Fig. 11; while the intermediate positions are indicated in Figs. 9 and 10. The high position of a needle 14 when its lower end is riding on the high leved 4^d of cam 4 is seen in Figs. 1 (at the right) and 12. Turning now to observe the movement of one of the outer needles 20, whose lower angular projecting arm 21 is traveling in the groove of cam 5 and whose lower end 25 is riding on the horizontally irregular path of cam 5, it will be seen that since this needle is movably carried in a vertical passage in the head 6 it is thereby pivoted in the head 6 and is horizontally movable on this pivot by the action of the angular arm 21 in the cam groove, the result of such action being the horizontal rotation of the upper angular arm 22 and its tip 23, and said horizontal vibration of the tip 23 takes place simultaneously with the lifting and lowering of the needle in consequence of the movement of the bottom end 25 upon the horizontally irregular path of cam 5.

This operation may be described as follows: When an inner needle 14 is in the position shown at the left in Fig. 1 and also in Fig. 14, the companion needle 20 will, as soon as its projection 21 drops out of

groove 34 at shoulder 5^e, take the position shown in Fig. 14, where the tip 23 will be directly on the opposite side of the staple 12 from the hooks 15 of said needle 14. Said inner needle 14 now begins to rise as it travels along the cam segment 4^a and 4^b, until, through the positions in Figs. 9 and 10, it reaches the half-elevated position in Fig. 11 where it is riding on the cam segment 4^b; and simultaneously therewith the outer needle 20 is elevating its tip 23 by virtue of the sliding of the end 25 on the cam segment 5^a, but there will be no other movement of said needle 20 except one of elevation so long as the angular arm 21 travels through the concentric segment 30 of the cam path, but by the time the tip 23 has risen above the staple 12, passing from the position shown in Fig. 14 into the position shown in Fig. 9, it will by reason of the fact that the angular arm 21 then begins to act in the eccentric segment 31 of the cam which is of increasing radius, gradually turn the needle 20 on its pivotal mounting in the head 6 and thus swing the tip 23 around over the staple 12 into the slot 16 between the hooks 15 of the bifurcated upper end of companion needle 14, but as stated, since needle 14 is now riding on the horizontal cam segment 4^b, the first entry of the needle tip 23 into the slot 16 will be at a distance below the hooks 15 so that it will not strike against the yarn or thread carried by the hooks 15, as shown in Fig. 10. This inner position of the tip 23 will be maintained until the angular arm 21 reaches the curved eccentric segment 32 and drops into the connecting segment 33, but before it does that the lower end 25 of the needle 20 will have come into contact with the ascending segment 5^c and been elevated into the position shown in Fig. 11 where it engages the yarn loop which is being carried by the hooks 15. When so engaged, as indicated in Fig. 11, the continued travel of the inner needle 14 will cause it to rise up on the segment 4^c until it reaches the segment 4^d and is in its high position, as shown in Fig. 12, where it engages the main incoming strand of yarn and at this time the tip 23 of the companion needle 20 swings outwardly again, which it will do by reason of the movement of the angular arm 21 in the eccentric path 33, which carries it into the concentric path 34 and moves it outwardly into a position where it will clear the staple 12 and will carry with it the loop which it took in Fig. 11, holding the same in place as in Fig. 12 until the needle 14 reaches the end of the horizontal segment 4^d and drops off the shoulder 4^e, when it will carry the fresh piece of yarn taken in Fig. 12 downwardly through the loop that is being held by the needle 20, as shown in Fig. 13, thus forming a stitch, and will for the time being hold the stitch in the position shown in Fig. 13 and that shown in Fig. 11, the needle 20 being meanwhile released as soon as its angular arm 21 is disengaged from the cam groove segment 34 at the shoulder 5^e (see Fig. 14). From this, therefore, will be understood that the detailed movement of the needles in their travel, their circular paths being correspondingly elevated and depressed in proper relation to each other and in proper sequence to handle the strands of yarn, fiber, fabric, thread or other material for the formation of stitches in the production of either a tubular cord, like that indicated at 40 in Fig. 6 or the formation of any other kind of knitted article, for which this toy knitter may be found to be adapted for use.

The admission of the yarn 10 through the perforation 9 in the casing 8 and its delivery to the needles is clearly illustrated in Fig. 2. Assuming that it is first looped about the needles by hand, it will be quite evident how the formation of stitches progresses, and in addition to the foregoing explanation of the operation of the different needles it may be remarked that each time an inner needle 14 is elevated it will take hold of the yarn 10 because it will be in a position to seize it after it enters the perforation 9. This is evident by observing the relation of the needle 14 to the perforation 9, and in Fig. 2 it is indicated just how the yarn is caught by the needle in its forward movement around its circular path. In Fig. 12 the inner needle 14 is also seen as holding the yarn, the needle 14 being now in its high position, and shortly thereafter when the needle reaches the shoulder 4^e it drops off and carries the yarn down through the loop which is being held by the other needle 20, as shown in Fig. 13, immediately after which the needle 20 is set free to perform its later work in grasping the new loop so formed or new stitch so made, and holding it until the inner needle again catches hold of the yarn and thrusts it through the loop so formed, for it will be seen that passing from Fig. 14 to Fig. 9 and then to Fig. 10 and thence to Fig. 11, the loop which was made in Fig. 13 is held by the inner needle while the outer needle is making its movements preparatory to laying hold of said loop and taking it away from the inner needle which it prepares to do in Fig. 11, and which it actually does in Figs. 12 and 13, holding it firmly now so that the inner needle which has meanwhile established a new relation with the main strand of yarn can thrust said yarn down through the loop and form a stitch. The same cycle of operations is gone through with again and again, and this plurality of movement and formation of stitches takes place in the particular example of the invention which I have herein illustrated and

shown at four distinct points at each of which are placed a pair of needles; and obviously it may take place at as many points as there are pairs of needles in the circular series, the result being that four stitches are made at once, and these are all worked together neatly and effectively into a tubular mesh which is in the form of a cord or length of material, as indicated in Fig. 6, and to provide for the disposition of which I find it most convenient to have the longitudinal passage 3 in the internal member 2 so that the cord can emerge from the lower end thereof, and it is a convenient plan to attach a weight 41 to the end of the cord to hold it taut in the device and permit the knitting operation to proceed in the best way, the stitches being formed more correctly and evenly than would be otherwise the case. It must be understood, however, that although I have shown this tubular cord, I do not wish to be restricted to the manufacture of anything of the kind, but can make whatever the arrangement of the needles and general design of their working prepare the machine for service with, inasmuch as the same is susceptible of a wide variety of uses and applications.

Many changes may be made in the precise construction and relative arrangement of the various parts of my device without exceeding the proper scope of the appended claims, and I, therefore, reserve the liberty of making all such changes and rearrangements in the construction and design of the whole toy and its various constituent parts as are best suited for use not only as a toy for pleasure and temporary gratification, but as a workable machine for actual service in the production of commercial results.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a knitting device, the combination of a support, a needle carrier, one of which is rotatable in relation to the other, one or more pairs of needles in the needle carrier, and cam means on the support for imparting a vertical movement to certain of the needles and also imparting a vertical and a horizontal movement to the rest of the needles for the purpose of causing said needles to perform the knitting operation.

2. In a knitting device, the combination of a support, a needle carrier, one rotatable in relation to the other, vertically movable inner needles, cam means on the support for controlling the action of the same, vertically and horizontally movable outer needles, and cam means on the support for controlling the action of the same.

3. In a knitting device, the combination of a support, a needle carrier having a member passing through the support and provided with a handle, a needle carrier and the support being movably related to each other, a series of needles reciprocating in the needle carrier, cam means on the support for causing said reciprocation, a series of needles also in the needle carrier and movable vertically and horizontally, and double cam means on the support for causing the double movement of the latter needles.

4. In a knitting device, the combination of a support, a needle carrier mounted in said support, a series of vertically-reciprocatory needles in the carrier, cam means on the support for acting against the lower ends of said needles and imparting a reciprocation thereto, another series of needles contiguous to the first named needles and likewise movable in the needle carrier and susceptible of a vertical reciprocation and also a horizontal oscillation, and a double cam means on the support for vertically and horizontally moving the latter needles, so that the action of the ends of the needles with relation to each may perform a knitting operation.

5. In a knitting device, the combination of a needle carrier provided with a handle, needles mounted in said carrier in pairs, an annular member surrounding an extension of the needle carrier and having its upper edge formed as a cam track to act to reciprocate certain of the needles, and another annular member surrounding the aforesaid annular member and having its upper edge formed with a cam track and also with a cam groove for imparting a vertical and a horizontal movement to other of the needles whereby the knitting ends of the needles perform the knitting operation.

6. In a knitting device, the combination of a tubular needle carrier having an extension provided with a handle, a pair of cam annuli on said tubular extension whose cam devices differ from each other to afford a plurality of operations, pairs of needles supported in the needle carrier the inner members of which pairs are vertically reciprocated by certain of the cam means and the outer members are moved vertically and horizontally by other of the cam means, so that the upper ends of the needles which project above the needle carrier may have a series of movements with reference to each other designed to act upon the yarn or other material for the purpose of forming stitches in the knitting operation.

7. In a knitting device, the combination of a support, a needle carrier having an extension concentric with said support, needles in said carrier, a protecting shield attached to said support and extending above the carrier and the needles, cam means on said support for reciprocating the inner needles, separate cam means on the support for moving horizontally and vertically the outer needles, and means for delivering the

yarn or other material to the needles to be handled thereby, and means for carrying off the knitted fabric.

8. In a knitting device, the combination of a needle carrier having a handle, pairs of needles supported therein, the inner members of each pair being vertically reciprocatory and having hooked ends, and the outer needles of each pair being vertically reciprocatory and also pivotally supported so as to have a horizontal swing, and having terminal projections that operate in connection with the hooked ends of the other needles, cam means for causing a vertical reciprocation of the inner needles, and cam means for imparting a double movement to the outer needles.

9. In a knitting device, the combination of a needle carrier, a series of inner needles having their upper ends hooked and cleft, a series of outer needles having their upper ends provided with bent tip-provided sections, staples in the head between the inner and outer needles, and cam means for imparting reciprocatory movements to the inner needles and reciprocatory and horizontal movements to the outer needles whereby the knitting operation is performed.

10. In a knitting device of the class described, the combination of a needle carrier having vertical passages therein, a series of inner hooked and cleft spring-provided needles located in one set of passages, a series of tip-provided and spring-provided needles located in another set of passages, the latter needles having angular projections on their lower ends, a cam annulus having a track designed to act upon the lower ends of the inner needles, another cam annulus having a track designed to act upon the lower ends of the outer needles and having also a groove which engages and exerts a pivotal action upon the angular lower end of said needles, whereby the active ends of the needles are movable in relation to each other for the purpose of engaging the yarn and forming stitches during the knitting operation.

In testimony whereof I hereunto affix my signature.

ROBERT W. STEED.

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