O. F. OAKES.

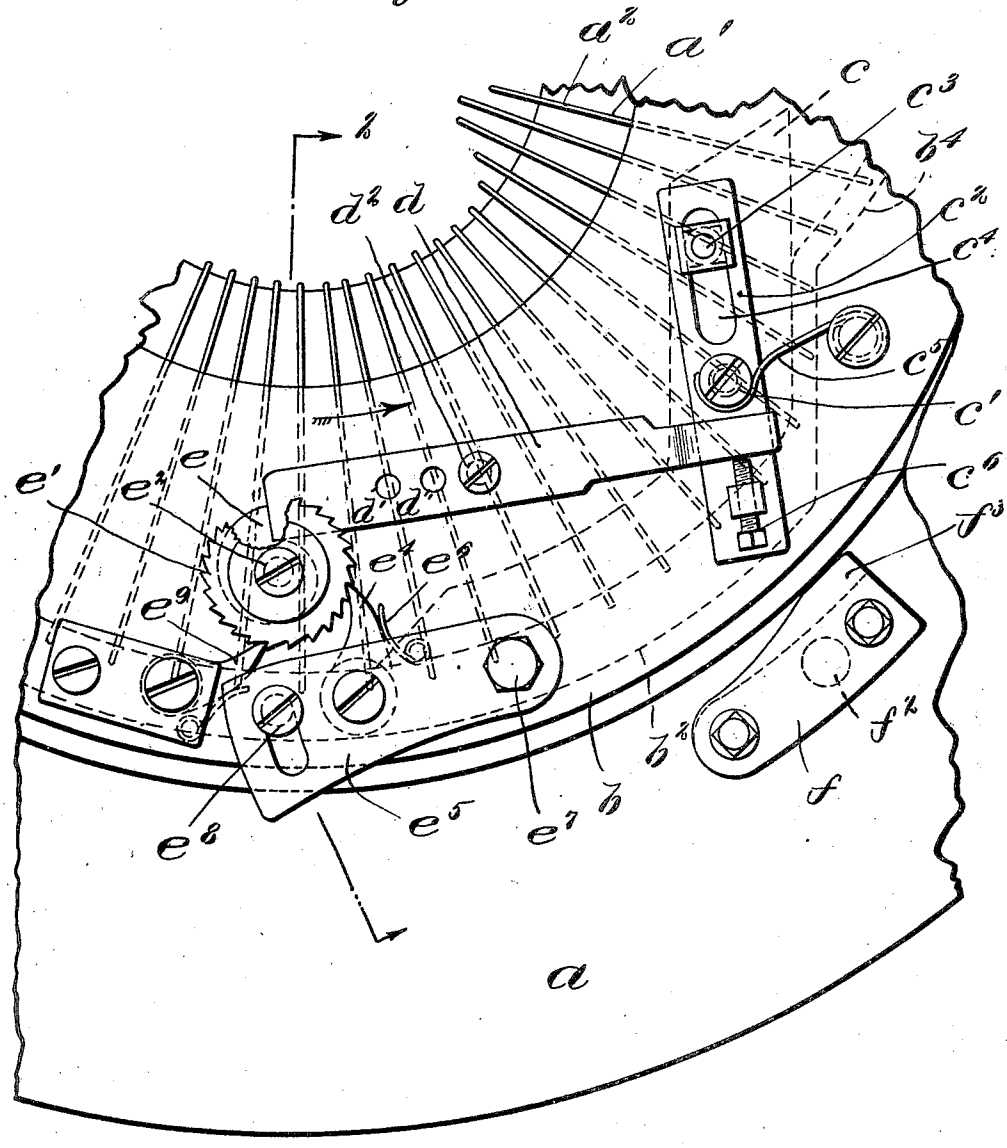
AUTOMATIC STITCH CONTROLLING MEANS FOR KNITTING MACHINES.

APPLICATION FILED JUNE 24, 1919.

1,430,836. **Patented Oct. 3, 1922.**

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

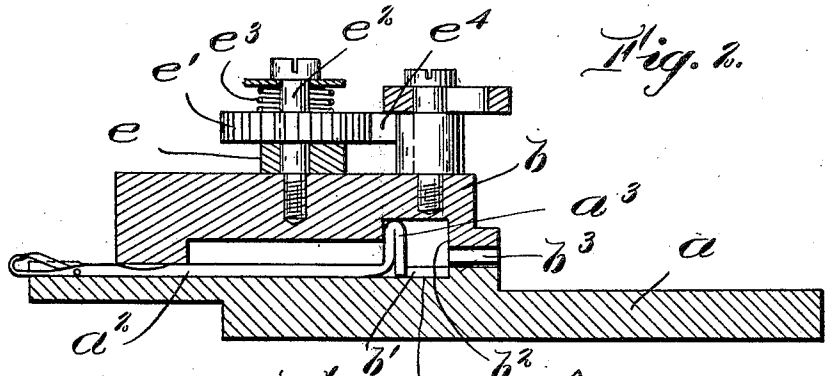


Fig. 2.

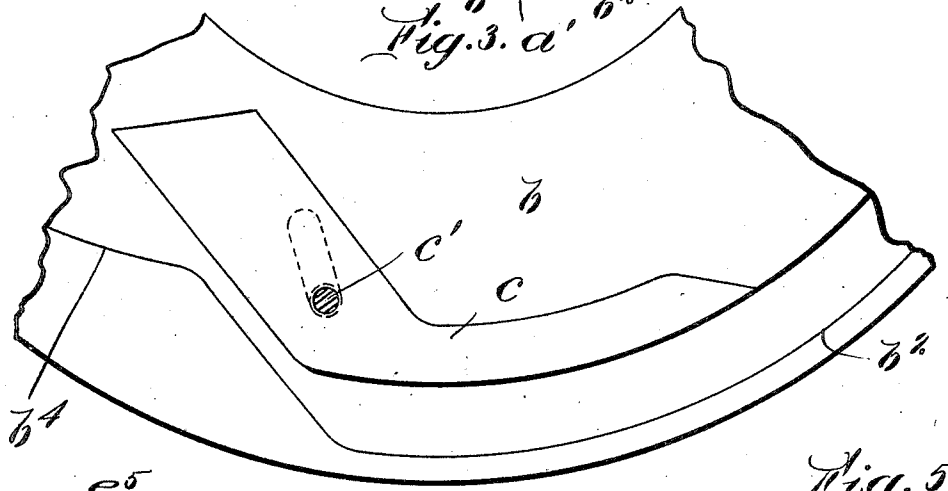


Fig. 3. a'

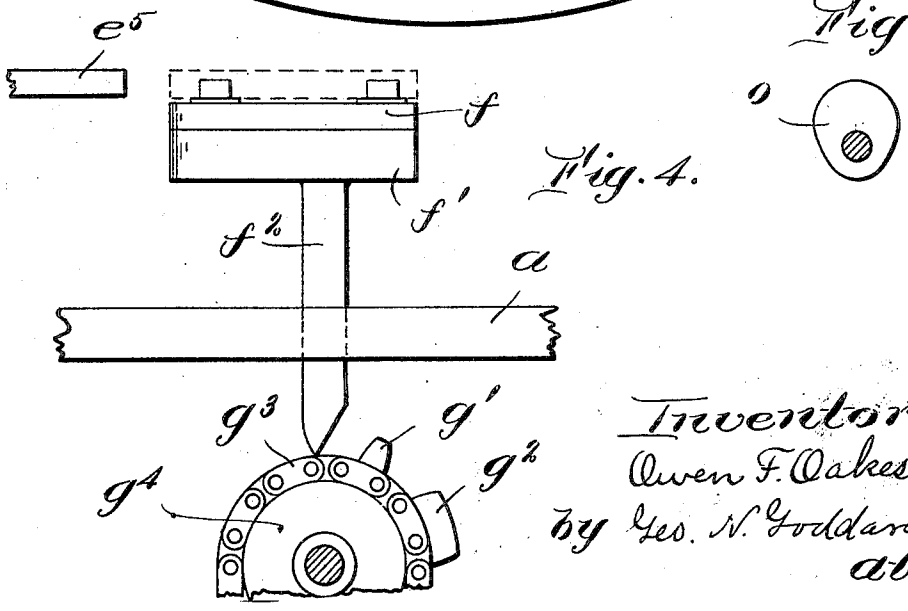


Fig. 4.

Fig. 5

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UNITED STATES PATENT OFFICE.

OWEN F. OAKES, OF BOSTON, MASSACHUSETTS.

AUTOMATIC STITCH-CONTROLLING MEANS FOR KNITTING MACHINES.

Application filed June 24, 1919. Serial No. 306,823.

To all whom it may concern:

Be it known that I, OWEN F. OAKES, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Stitch-Controlling Means for Knitting Machines, of which the following is a specification.

This invention relates to knitting machines and is intended to provide a simple automatically controlled mechanism or attachment capable of being applied to various forms of knitting machines as they are already made and used for the purpose of widening or narrowing the knitted article by intermittently and progressively changing the length of the stitches formed in the article being knitted, such for example as a tubular sleeve shown in my former Patent No. 1254722, Jan. 29, 1918.

To this end the invention consists, generally speaking, in the combination with the usual rotary cam plate which throws in the needles successively for the knitting operation, of a needle retracting cam whose relative position to the cam plate may be varied to vary the length of different courses of stitches, and an automatic intermittently acting mechanism for shifting said retracting cam to different positions of adjustment at any predetermined intervals, provision being made to vary the starting point of the needle cam and also to vary the extent of its intermittent adjustment.

For convenience I have shown in the accompanying drawings the manner in which the principle of this invention may be applied to an ordinary dial machine, but it will be understood that the same principle of control and operation is equally applicable to other types of circular knitting machines as well.

In the drawings I have shown only so much of the well-known construction of the knitting machine itself as is necessary to a complete understanding of the construction and operation of my automatic attachment therefor.

Figure 1 is a vertical plan view showing a portion of the circular needles with the rotary cam plate and the relation of my attachment thereto.

Figure 2 is a detail showing a vertical section of the ratchet wheel and the intermittently acting shifting cam by which the adjusting movements of the retracting cam are effected.

Figure 3 is a bottom plan view showing the automatically adjustable cam for retracting the needles.

Figure 4 is a detail showing in side elevation the automatic controlling means by which the intermittent action of the shifting cam is effected.

Figure 5 shows a modified form of intermittent shifting cam by which the change from the large diameter to the small diameter or vice versa is effected gradually instead of at a single step.

In the practice of my invention as applied to a circular knitting machine of the dial type, according to the form illustrated in the drawings, the stationary bed plate a is provided with the radial grooves a' for receiving the radially arranged needles a^2 which perform the knitting operation.

Above the bed or needle plate is mounted the circular cam plate b having on its under side the usual gear ring b^3 by which the cam plate is rotated by the usual driving gear (not shown). The cam plate b is also provided with the depending peripheral flange b^2 which at the proper point is provided with the inwardly projecting swell b^4 which engages the butts a^2 of the needles to throw the needles in toward the center in the knitting operation.

On the underside of the cam plate adjacent to the swell b^4 is mounted the retracting cam c which performs the usual function of the retracting cam but which, in this case, is mounted not only to permit adjustment relative to the cam plate nearer to or farther from the center, but also is so arranged and co-ordinated with other parts of the mechanism constituting my automatic attachment that its relative position toward or away from the center may be varied either at each revolution or as many times as desired during one revolution or only after a series of revolutions of the cam plate in the manner hereinafter to be described.

It will be understood that the nearer to the center the cam c is supported the less will be the distance through which the needles are successively retracted or drawn into the needle plate by successive engagement of the needles with the retracting cam. It will also be understood that the less the needles are retracted from their full inward

traverse, that is, the farther the needles are allowed to remain projected beyond the inside edge of the needle or dial plate a the less will be the length of each loop of yarn on the needle and the shorter the stitches, and consequently the less the diameter of the knit tube, while conversely, the farther back the needles are retracted the longer will be the length of loops of yarn left on the needles and the wider will be the diameter of the knit tube.

The retracting cam c is rigidly secured to a slidable support by an upwardly extending post c' which projects through a suitable slot in the cam plate b. At its upper end this post is rigidly secured to a slide block or plate c^2 which rests slidingly on the top of the plate b and is guided and kept in place by a headed pin or screw c^3 whose shank passes down through a slot c^4 formed in the cam supporting plate c^2. A spring c^5 tends to throw the cam inwardly, while the outward movement of the cam is effected by means of a lever d retained and pivoted on the pivot pin d^2 secured to the top of the cam plate and having its outer end in engagement with some portion of the plate c^2. In this instance the engagement of the working end of the lever d is against an adjustable member or screw c^6 carried by a lug on the top of the plate c^2 so that the relative position of the cam supporting plate and of its actuating lever may be varied to meet any desired requirement of the particular work to be performed. The length of throw of the lever d may be varied by providing said lever or arm with a series of pin-receiving holes d' in which the fulcrum pin d^2 may be inserted thereby shortening the power arm and lengthening the work arm of said lever.

The cam shifting lever d may be actuated by any appropriate form of mechanism that will produce the desired result. In the present case I employ for that purpose a rotatable cam e loosely mounted on the fixed stud e^2 and compounded with or secured to a ratchet wheel e' which ratchet wheel is actuated by the pawl e^4 of the pawl arm e^5 which is pivoted at e^7 and which is limited as to its actuating movements by the pin e^8 passing through a traverse slot in said arm e^5 and secured to the cam plate b. A spring detent e^9 is located to engage the ratchet wheel e' to prevent backward rotation thereof. A compressed spring e^3 surrounding the pivot post e^2 presses the combined cam and ratchet wheel frictionally against the top surface of the cam plate in order to prevent it from being too easily turned.

The actuating pawl for the shifting cam e is controlled as to its movement by the cam plate f which is secured to the head f' of a vertical slidable pin f^2 which is mounted in the bed plate a said plate projecting inwardly at f^3 to lie in the path of and engage the outwardly projecting side of the arm e^5 which actuates the shifting cam through the ratchet and pawl connection.

It will be understood that if I were to use only a single stationary cam member f located permanently so as to engage the arm e^5 then each successive revolution of the cam plate would result in moving the ratchet and consequently shifting cam e one step at each revolution. If the stationary cam plate f be duplicated at another point on the periphery of the bed plate a then such step by step operation would take place twice during each revolution.

Now to knit the form of article described in my aforesaid Letters Patent, it is desirable that quite a number of courses of stitches be knitted before there is any shift of the retracting cam to vary the length of the stitches. To control positively the intermittent shifting of the retracting cam I provide automatic mechanism by which the pawl actuating cam f^3 may be brought into or moved out of operative relationship to the pawl arm e^5 at any interval or for any period that may be desired according to the requirements of the particular work to be done. This is accomplished by mounting the controlling cam f on the movable support f' f^2, the movements and the position of said support being controlled by an automatically movable pattern chain comprising the links g^3 and the raised blocks g', g^2 which are intermittently operative owing to the automatic revolution of the chain wheel g^4 in the usual manner in which pattern chains of knitting machines are commonly actuated. When the stationary cam member f is raised to the position shown in dotted lines in Figure 4 its projecting lip or edge f^3 will be in alignment with the path of movement of the pawl arm e^5, and consequently there will be a movement of the pawl and of the shifting cam e and of the retracting cam c, and hence a change in the position of the needles when retracted and a change in the length of the course of stitches. The automatic pattern chain may be so designed that the cam f may be kept out of engagement for as many revolutions of the cam plate as may be desired before shifting the cam to operative position for re-adjustment of the needle retracting cam.

I may knit a course of tubular articles such as the sleeve described in my aforesaid patent by knitting from the small to the large diameter of one sleeve and then continuing the knitting going suddenly to the small diameter of the next sleeve thus forming a tubular chain of sleeves in which the large diameter of one sleeve joins the small diameter of the next sleeve in the chain. In such case the cam will have the shape indicated in Figure 1 with a gradual rise to

the high point and a sudden jump off to the low point of the cam.

On the other hand, a continuous chain of tapered sleeves or other articles may be knit by proceeding from the small to the large diameter or vice versa and then gradually returning from the large diameter to the small diameter and from the small diameter to the large diameter again. In such case we have a gradual rise to the high point and a gradual descent on the other side to the low point as illustrated in cam *o* shown in Figure 5.

What I claim is:

1. In a tubular knitting machine, the combination with a circular series of needles, of a needle-retracting element movably mounted on the cam plate to be automatically adjusted nearer to or farther from the centre thereof, a positioning lever operatively connected with said retracting element, a rotatable positioning cam operatively related to said lever, a ratchet and pawl for intermittently rotating said cam step by step, a pawl-actuating member mounted independently of the cam plate and movable into active or inactive position to engage and actuate said pawl to progressively vary the position of the retracting element on different rotations of the cam plate, substantially as described.

2. In a tubular knitting machine, the combination with a circular series of needles, of a needle-retracting element movably mounted on the cam to be automatically positioned at different distances from the centre of different rotations of the cam plate, a positioning lever therefor having adjustable operative engagement therewith, a rotatable cam positioned to engage the opposite end of said lever, a ratchet connected with said cam, a ratchet-actuating pawl and a pawl-actuating member arranged to be shifted into operative relation with said pawl on any predetermined revolution of the cam plate in order to progressively position the retracting element, substantially as described.

3. In a tubular knitting machine, the combination with a circular series of needles, a needle-retracting element movably mounted to assume different positions with relation to the centre of the cam plate, a positioning lever arranged to have operative connection with said retracting element, said lever being provided with a plurality of selective fulcral points to vary its action upon the retracting element, an intermittently rotated cam cooperatively related to said lever to swing the lever about its fulcrum step by step, a ratchet and pawl for actuating said cam, a pawl-actuating member and automatic controlling means by which said pawl-actuating member is rendered active on a predetermined revolution of the cam plate and is rendered inactive upon other revolutions of the cam plate, substantially as described.

In testimony whereof I have affixed my signature.

OWEN F. OAKES.