

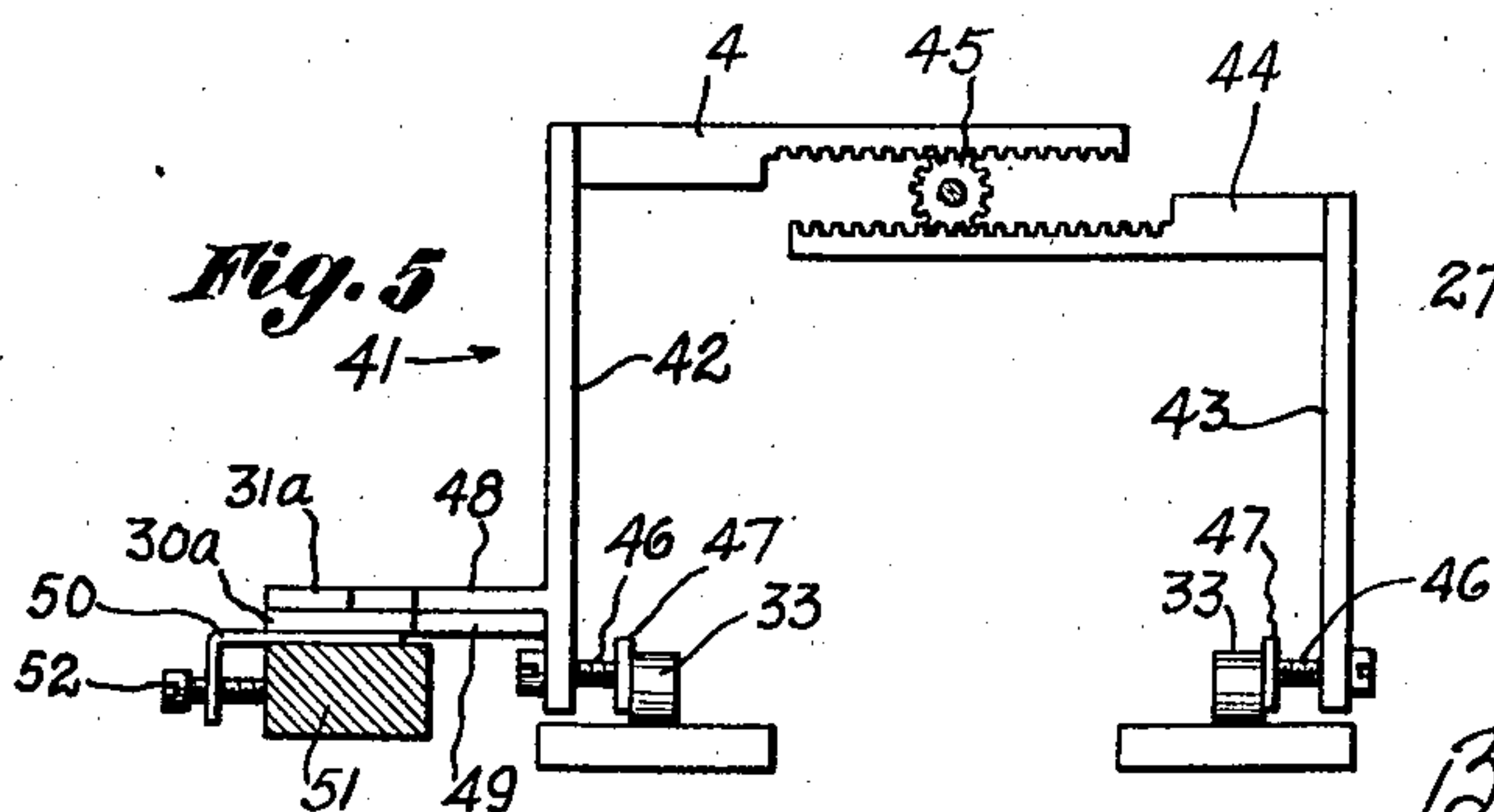
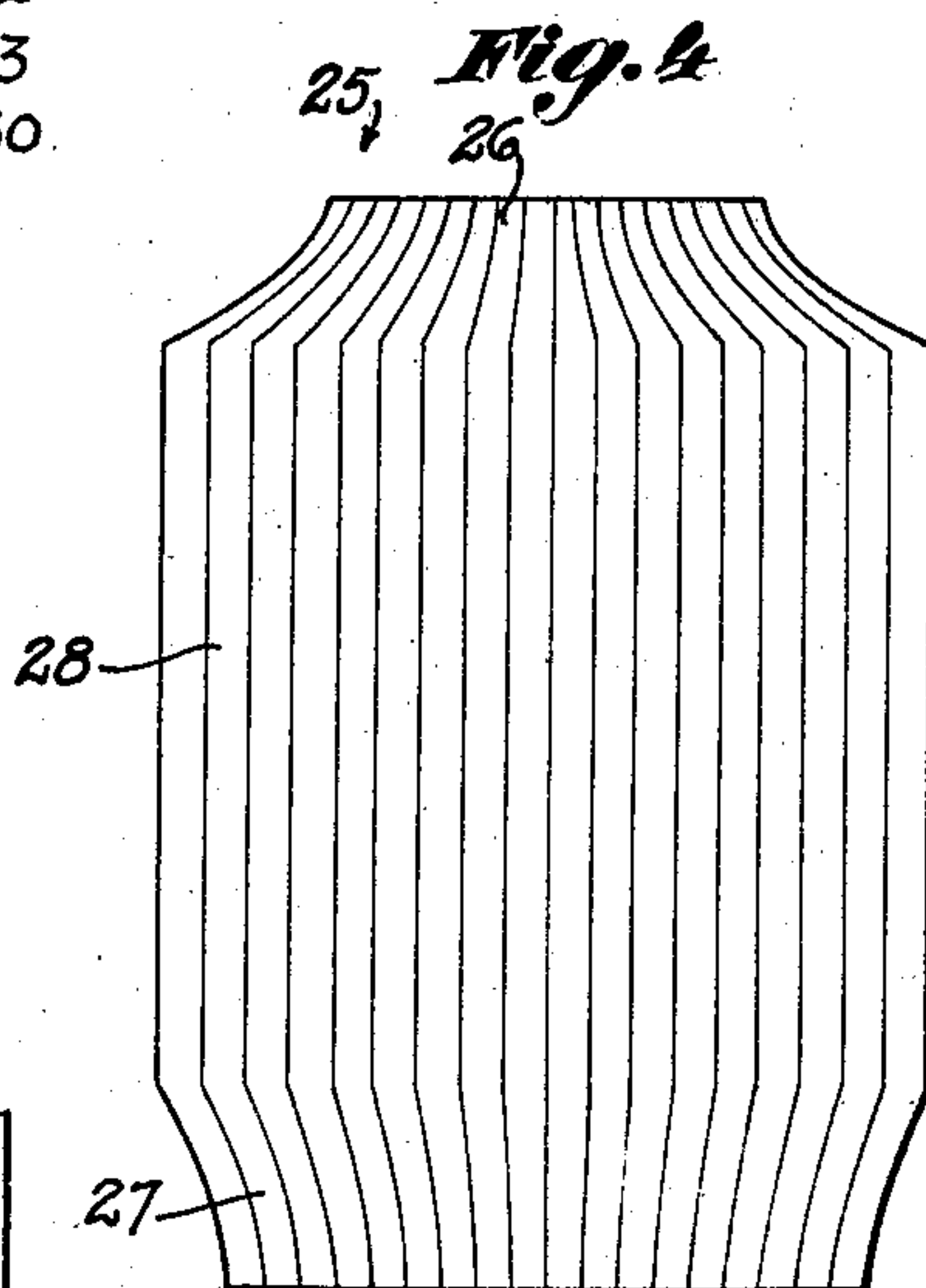
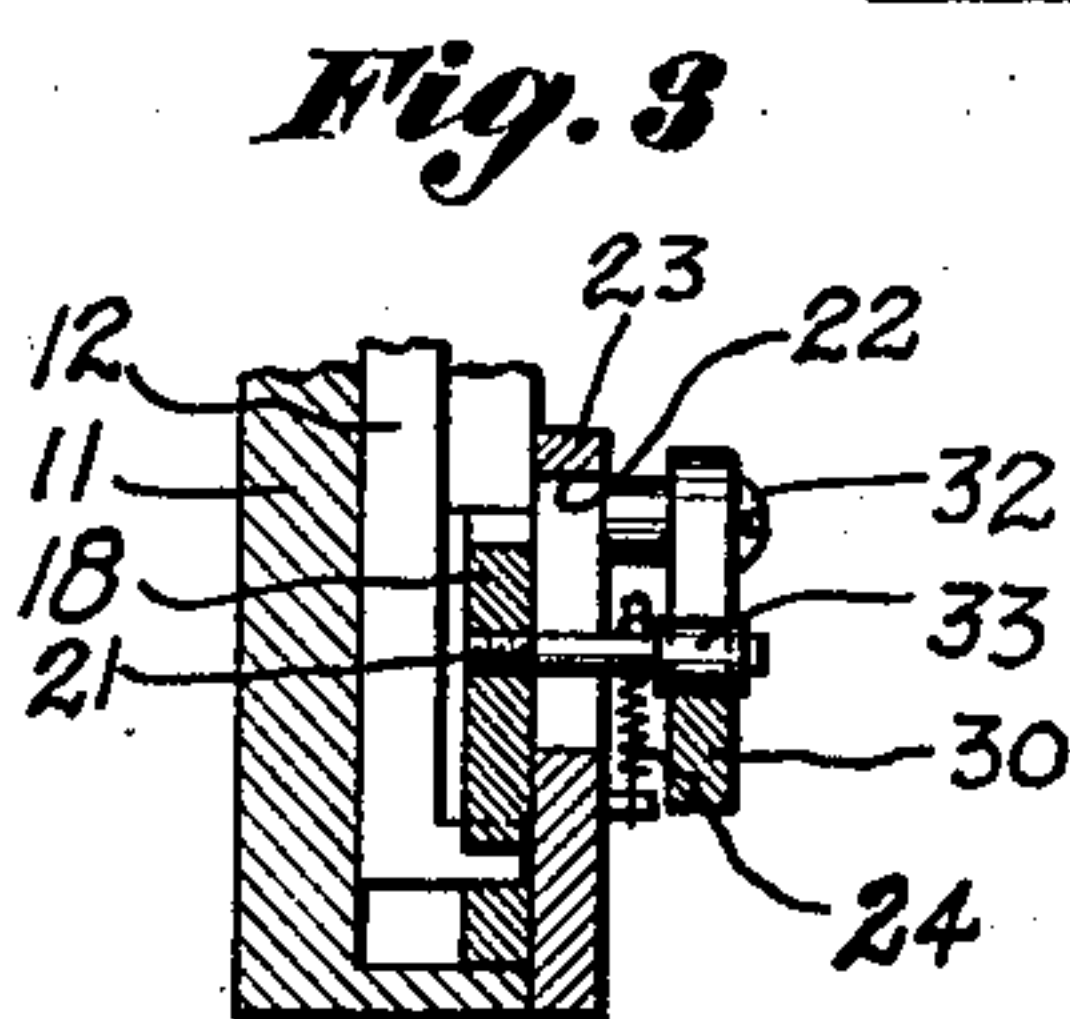
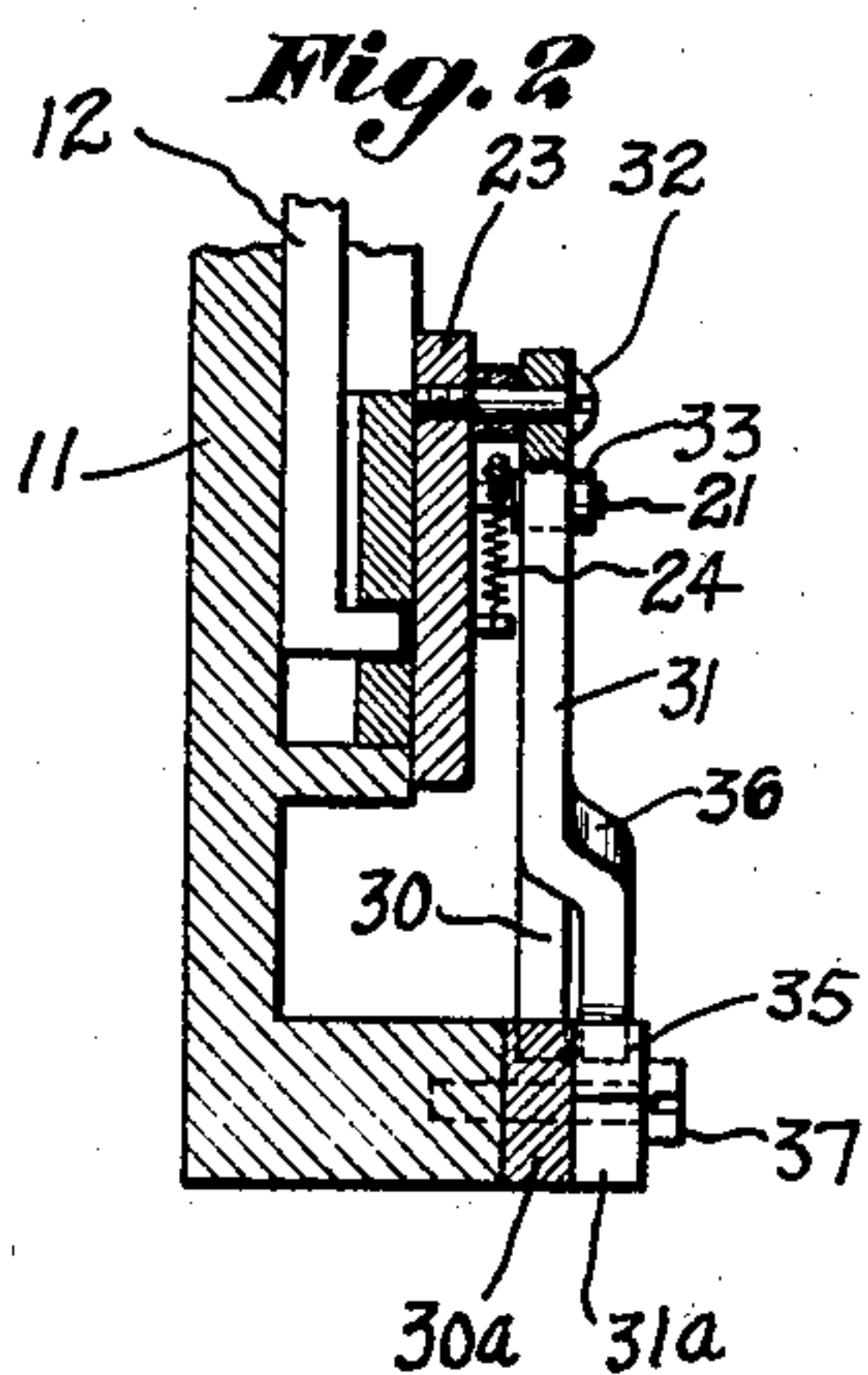
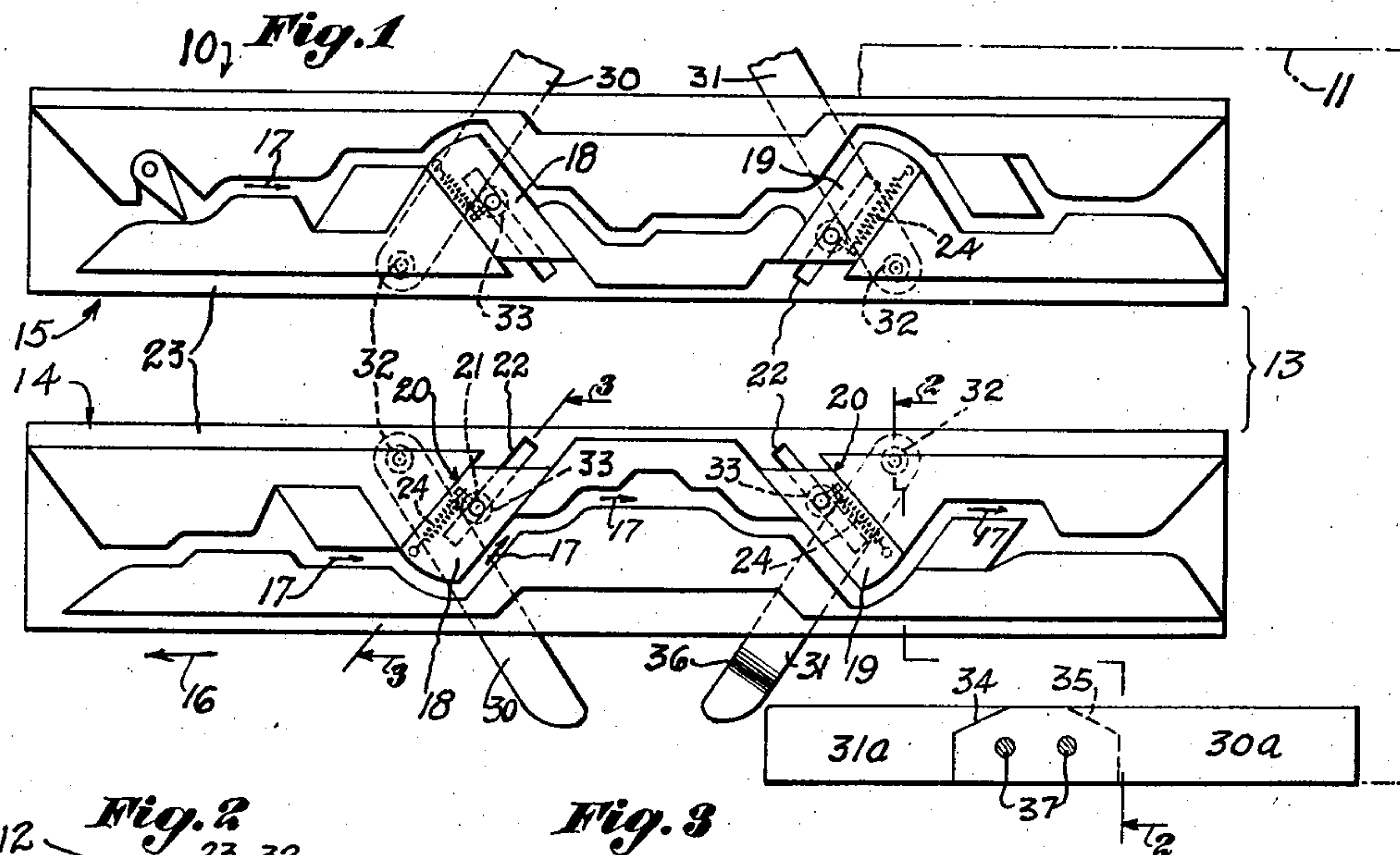
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2,183,719

KNITTING MACHINE

Filed July 1, 1938



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## UNITED STATES PATENT OFFICE

2,183,719

## KNITTING MACHINE

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11 Claims. (Cl. 66—71)

This invention relates to knitting machines of the flat and links and links type.

One object of this invention is to provide a knitting machine of the character described having improved means for automatically changing the tension of the stitches at a desired point along a line of knitting, to thus produce a fabric having a section tensioned transversely of the lines of knitting.

Heretofore articles such as sweaters having integral tensioned cuffs have been provided with the lines of knitting being horizontal, that is, lengthwise of the cuff. We perceived that the design possibilities of a sweater having vertical lines of knitting and consequently adapted for decorative vertical ribs or stripes, were considerable. But it was considered in the art that such a sweater could not be produced on any known machine.

It is therefore an object of the invention to provide such a sweater and also an apparatus and method of producing the same on a quantity production basis.

Another object of the invention is to furnish a knitting machine having improved means for automatically varying the position of the tension control cams at a point along the path of reciprocation of the cam head, in such a manner that the change in tension of the knitting occurs intermittently during the operation of the machine.

Another object of the invention is to provide such tension adjusting means which are settable to influence the tension in varying degrees and/or at different points along the bed of the machine, and even to provide for graduated tension effects if desired.

A further object of the invention is the provision of improvements of the nature set forth which shall be inexpensive to manufacture, applicable to a knitting machine without change in the construction thereof, and which shall be convenient to adjust, accurate in operation, durable, efficient and reliable in use, and permit the knitting machine to otherwise operate in the usual manner and for the usual purposes.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawing, wherein like parts are designated by the

same reference characters throughout the several views.

In the drawing:

Figure 1 is a diagrammatic plan view of the cam head of a knitting machine showing our improvements in connection therewith, according to an embodiment of the invention, with the bed of the machine shown in dot-dash lines.

Figs. 2 and 3 are sectional views taken on lines 2—2 and 3—3 respectively of Fig. 1.

Fig. 4 is a plan view of a body portion of a sweater showing a sample of the material knitted by the machine, embodying the invention.

In Fig. 5 is shown a schematic view in elevation showing a further improvement in the machine.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing the preferred exemplification of the invention.

Referring in detail to the drawing, 10 denotes a knitting machine of the flat or links and links type embodying the invention. The same may include a conventional knitting machine of the type referred to having an elongated bed or frame 11 grooved to contain transversely reciprocating needles and jacks 12 for controlling the same. Reciprocable along the bed member 11 is a head 13 comprising a cam head 14 for the front of the machine and a cam head 15 for the rear of the machine, movable as a unit. These cam heads actuate the jacks 12 to cause the knitting operation upon each run or stroke of the machine. It will be unnecessary to describe the cam head further than to point out that for the purposes of this invention both heads 14, 15 may be regarded as duplicates of each other, that the cam positions shown are taken with the cam head 13 moving toward the left as shown by the arrow 16 so that the jacks travel in the cam grooves as shown by the arrow 17; and that the cams 18, 19 are settable for controlling the size of the loops or stitches and hence the tension thereof, and that in the position shown, these cams are set for stitches of maximum size. It may be noted that when the cam head 13 travels toward the left, the right hand cam 19 is actually controlling the size of the stitches knitted, whereas when the cam head 13 is traveling to the right,



the left hand cam 18 is actually controlling the size of the stitches. Further, it will be perceived that as the cams 18, 19 move toward the center of the machine, the throw of the jacks and consequently of the needles is diminished and hence the needles draw less yarn and form smaller and consequently tighter stitches.

One conventional manner of mounting and controlling the cams 18, 19 is to arrange them for sliding movement as in grooves 20 and to hold them in place as by a headed member 21 extending through a slot 22 in the head plate 23 of the cam head. A tension coil spring 24 may be connected to the plate 23 and to the member 21 of each cam 18, 19 to move the same to the position for causing the formation of large stitches. Any suitable means such as a stop or set screw (not shown) is normally used to set the cams 18, 19 inward in adjusted position against the tension of the springs 24, whereby stitches of a desired size or tension are uniformly formed throughout the path of reciprocation of the cam head.

According to the present invention, improved means are provided whereby the tension or size of the stitches need not be the same throughout the path of reciprocation of the cam head, but may vary at one or more points, whereby an article such as the sleeveless sweater 25 may be produced. The latter is characterized by vertical lines of knitting, instead of by horizontal lines of knitting, if the garment is turned 90 degrees from the position in which it leaves the machine, and nevertheless includes one or more transversely tensioned sections such as the neck and shoulder portions 26 and the cuff 27 integral with the waist portion 28, a result which could not heretofore be accomplished. This sweater is more particularly described and claimed in our copending patent application thereon. Suffice it to indicate that the same permits the use of much more decorative vertical ribs or stripes than the horizontal ribs or stripes heretofore used. The improvements that will now be described permit the manufacture of the sweater 25 on a quantity production basis.

Our improvements referred to include a means mounted on the cam head for moving the cams 18, 19 against the tension of their springs 24. For example, arms 30, 31 for the respective cams 18, 19 are pivotally mounted at 32 on the plate 23 in position to engage the heads 33 of the members 21. Mounted on the bed or frame 11 of the machine is another means in relatively fixed relation to the cam head and including a pair of elongated guide or cam members 30a, 31a extending longitudinally of each other and offset or staggered and longitudinally overlapping each other. The members 30a, 31a constitute a means occupying only a portion of the path of reciprocation of the cam head, the members being of equal length, which length is the width of the tensioned band or section to be knitted. The member 30a is in the plane of the arm 30, and the member 31a is above the same, with its arm 31 offset as at 36 to lie in the plane thereof. The members 30a, 31a may be secured to the frame 11 as at 37.

It will be noted that a graduated change in stitch tension may be produced by suitably shaping the cams 30a, 31a, as by means of the inclines 34, 35 which the arms 30, 31 first engage.

A particular advantage of our invention is that in knitting various colors, fewer yarn carriers are needed for the different colors if the

colors be formed longitudinally of the lines of knitting, instead of crosswise thereof as heretofore. It will be understood that in knitting sweaters the style requirements are that color stripes ought to extend vertically and not horizontally thereof. Therefore it is better that the colors extend coursewise. Thus the machine operation is greatly simplified.

In operation, the arm 30 coacts with the member 30a and the arm 31 coacts with the arm 31a. Assume that the cam head is moving toward the left, both arms 30, 31 are moved by their members 30a, 31a to cause inward movement of the cams 18, 19, but only the right hand cam 19 is operative to reduce the size of the stitches for increased tension. Similarly, the left hand cam 18 is effective when the cam head moves toward the right, although both cams are actuated by the members 30a, 31a. It will now be perceived that the reason for the offset relation of the members 30a, 31a is that the cams 18, 19 begin to act at spaced points, and the amount of offset is determined by that spacing, since the knitting of a tension band in a fabric between parallel lines required that the action of the cams 18, 19 begin and end at such lines for each run of the cam head and in both directions of the runs.

It will be appreciated that more than one means 30a, 31a may be provided along said path of reciprocation, and at any point or points thereof, and that any width of tensioned band may be knitted, and that the cams 18, 19 may be variously actuated, for instance, to normally cause tight instead of loose stitching to be formed as herein described. For instance, the means 24 may be regarded as moving these cams in one direction and the means 30a, 31a and 30, 31 as moving the cams in an opposite direction. Then again, the elements 24, 30, 31, 30a, and 31a may be regarded as a single means having portions to control the cams so that they are effective to begin and end operation at two parallel lines for knitting a band with the machine knitting on both runs of the cam head; or the means referred to being operable to control the cams to change their setting as a result of the movement of the cam head, with the change occurring intermittently and regularly during a run of the cam head to knit a section having substantially different stitch tension than adjoining sections of the fabric.

In Fig. 5 is shown a schematic view of another embodiment of the invention including a device 41 whereby only a front set of cam members 30a, 31a need be used, and whereby, if desired, only one tensioning adjustment may be made for the front and back of the machine. For example, the actuator extensions 33 of the cams 18, 19 are operated by standards 42, 43 having racks 44 interengaged by a pinion 45 having a fixed axis. The standards 42, 43 may each have set screws 46 having plates 47 for bearing on the elements 33. On the standard 42 is a fixed finger 48 to follow one of the cams 30a or 31a. A similar device including parts 42 to 47 and having a finger 49 which follows the other of the cams 30a, 31a. If desired, the latter may be mounted on an angle plate 50 on a frame member 51, interconnected by a set screw 52. By adjusting the latter, the setting is equally changed for both the front and rear standards 42, 43 or the same may be set by individual adjustment of their set screws 46, as in some cases, it is desired that the front of the machine shall knit at different tension than the



rear thereof. Otherwise the operation is the same as that for the machine 10.

We claim:

1. A knitting machine including a cam head reciprocable along a path to actuate needle controlling jacks, said cam head comprising spaced settable cams for causing the forming stitches of different sizes, and means for moving said cams in different directions for the setting movement thereof, one of said cams being operative in one direction of movement of the cam head and the other cam being operative in the opposite direction of movement of the cam head, said means including elongated guide members for the respective cams extending along said path, said guide members overlapping in longitudinally offset relation to each other and being in relatively stationary relation to the cams whereby one guide member actuates one cam in one direction and the other guide member actuates its cam in the opposite direction of movement of the cam head, and said guide members occupying only a portion of the path of the cam head and cooperating with the cams to cause the knitting of a fabric section defined by straight lines transverse to the lines of knitting, which section has a different stitch tension than adjacent parts of the knitted fabric.

2. A knitting machine including a cam head reciprocable along a path to actuate needle controlling jacks, said cam head comprising spaced settable cams for causing the forming stitches of different sizes, resilient means for moving said cams in one direction to cause large stitches to be formed, positive means for moving the cams in an opposite direction to cause small stitches to be formed, the different cams being operative to control formation of the stitches in different respective directions of movement of the cam head, elongated guide members extending along said path and being longitudinally offset in overlapping relation to each other and being fixed relative to the cam head, one of said members controlling one cam and the other the other cam, elements pivoted on the cam head and coacting with the individual members for respective control of the cams, said members occupying a limited portion of said path.

3. A knitting machine including a cam head reciprocable along a path, said cam head having spaced settable cams for controlling the needle actuating jacks to govern the size of the stitches formed by the needles, the cams being operative for thus controlling the jacks in different respective directions of movement of the cam head, and means for controlling the setting movement of said cams so as to change the setting thereof at a portion of said path, said means including a first means and a second means respectively controlling said cams according as the cam head moves in one or an opposite direction to cause the cams to control the size of the stitches, both the first and second means having a like length of control of the cams in course of movement of the cam head along its path, and said first and second means cooperating with said cams so that the paths of control of said cams by the first and second means are offset in overlapping relation to each other to cause the knitting of a uniform band transverse of the lines of knitting and characterized by a stitching tension different than that of adjacent portions of the knitted fabric produced by the machine.

4. A knitting machine according to claim 3, wherein said first and second means have cam

coaction with said cams for a graduated change in stitching tension.

5. A knitting machine according to claim 3, including rack and pinion means interengaging the tension causing cams at the front and rear of the machine, and cooperating with said first and second means to cause movement of said cams.

6. A knitting machine according to claim 3, including means interposed between said first and second means and the said cams at the front and rear of the machine, the interposed means having interconnected elements such that a movement of one element causes an equal movement of the other element in opposite direction, said elements carrying individual adjusting means for the cams, and the interposed means being actuatable by said first and second means.

7. A knitting machine according to claim 3, including a single means for the tension causing cams at the front and rear of the machine, said single means being interposed between the first and second means and said cams, the first and second means being located solely at one side of the machine, means for setting the first and second means for adjustment of said cams, and said single means including means to cause the said cams at the front and rear of the machine to move equally in opposite directions under actuation of the setting means.

8. A knitting machine according to claim 3, wherein the first and second means are located solely at the front of the machine, and means responsive to the first and second means for equally adjusting the tension causing cams at the front and rear of the machine, including individual adjusting means for the cams of the front and rear of the machine, and means for setting the first and second means as a unit for causing adjustment of the cams at the front and rear of the machine by a single adjustment.

9. A knitting machine including a reciprocatory cam head having spaced settable cams for actuating the needles of the machine to govern the size of stitches formed by the needles, the cams being operable in different respective directions of movement of the cam head, and means for controlling the setting movement of the cams including a first means and a second means respectively controlling said cams according to the direction of movement of the cam head to control stitch sizes, the first and second means cooperating with said cams so that the paths of control of said cams by the first and second means are offset in overlapping relation to each other longitudinally of the path of the cam head.

10. A knitting machine including a reciprocatory cam head having spaced settable cams for actuating the needles of the machine to govern the size of stitches formed by the needles, the cams being operable in different respective directions of movement of the cam head, and means for controlling the setting movement of the cams according to the direction of movement of the cam head to control the stitch sizes, said means being so related in position to the said cams that the paths of control for the different cams by said means are offset in overlapping relation to each other longitudinally of the path of the cam head.

11. A knitting machine including a reciprocatory cam head having spaced settable cams for actuating the needles of the machine to govern the size of stitches formed by the needles,



the cams being operable in different respective directions of movement of the cam head, and means for controlling the setting movement of the cams according to the direction of movement of the cam head to control the stitch sizes, said means having different operative positions for the respective cams so that the path of control

for the different cams by said means are offset in overlapping relation to each other longitudinally of the reciprocation of the cam head, said paths of control being equal in length.

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