April 30, 1946. E. ST PIERRE 2,399,403

YARN FEEDING DEVICE

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FIG. 1.

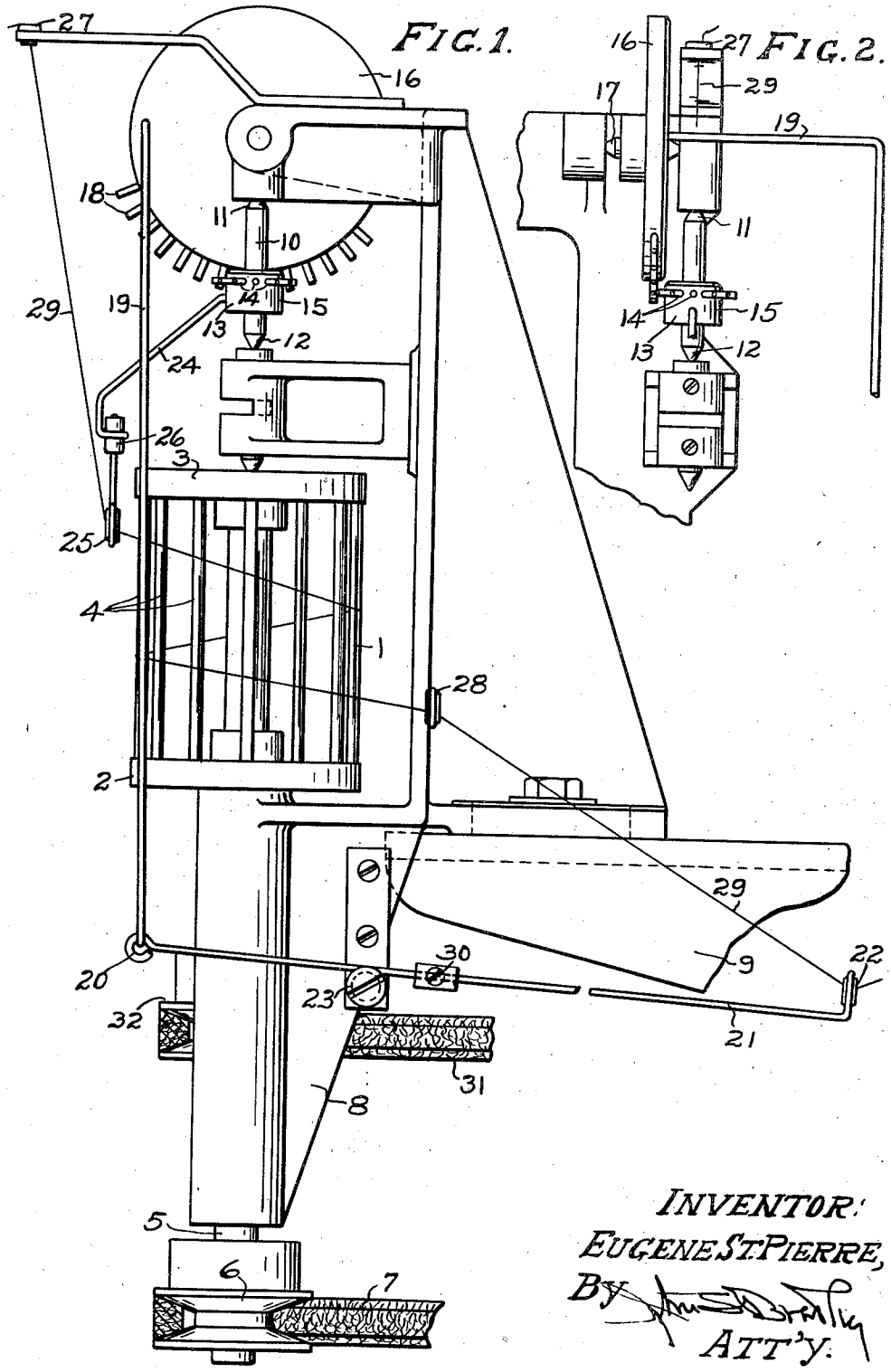


FIG. 2.

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YARN FEEDING DEVICE

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4 Claims. (Cl. 66—132)

This invention relates to mechanism for feeding yarn from the cone or other source to the needles of a knitting machine. The form described herein is designed for application to a circular, independent needle, knitting machine of the Banner type although it can be applied without difficulty to other machines of this and other types. Its primary object is to remove the yarn from the cone at a rate at least equivalent to that required by the knitting machine and, in so doing, to eliminate completely the variations in tension caused by the resistance of the yarn at the cone as it is unwound therefrom. Such a device must be able not only to remove yarn from a cone at varying rates depending upon the knitting requirements but it must be fully automatic even to the extent of becoming inactive when use of the yarn is discontinued.

In the knitting of a stocking the rate of yarn consumption varies frequently and over a wide range as the lengths of loops are altered, for example, or when a change is made from rotary to reciprocatory knitting. The yarn feed must be able to accommodate itself to all of these changes and, as already stated, must be also able to cease action entirely when the use of the yarn is discontinued. Although only one of the devices will be described, as many as desired may be used on a single machine, preferably one for each yarn. They may be separately driven by individual motors or other source of power or they may be connected together by gears or belts and driven from a single source. This may be some rotating part of the knitting machine itself.

In any case, the object of the device is to remove yarn from the cone at a rate at least as great as it is consumed by the knitting without at any time supplying a surplus of any consequence. The form of the device shown in the drawing is for illustrative purposes only. Many modifications can be made without departing from the scope of the invention.

In the drawing—

Fig. 1 is an elevation of the form of yarn feeding device of this invention selected for description herein; and

Fig. 2 is an elevation of a part thereof.

As shown in the drawing the device consists of a cylindrical cage 1 composed of two heads 2 and 3 connected together by spaced rods 4. Cage 1 is mounted upon a rotatable shaft 5 connected to a source of power indicated in Fig. 1 by pulley 6 and belt 7 but which may be a motor or any other desired source. Shaft 5 is vertically mounted in a suitable bracket 8 rigidly attached to a convenient part 9 of the knitting machine.

Above cage 1 and in alignment with shaft 5 is a short shaft 10 mounted on frictionless bearings, shown as cone bearings 11 and 12. Shaft 10 is provided with a hub 13 having radial spaced pins 14 constituting a pin gear 15. Above this is another pin gear 16 mounted on a horizontal shaft 17 and in such a way that its pins 18 will engage with pins 14 of gear 15. Adjacent the edge of pin gear 16 is pivotally mounted a rod 19 connected to one end 20 of a take-up lever 21, the other end of which is provided with an eyelet 22. Take-up lever 21 is pivoted, as at 23, so as to swing in a vertical plane. The hub 13 of pin gear 15 is also provided with an outwardly and downwardly extending arm 24 terminating in an eyelet 25 mounted on a swivel 26 so as to be able to turn independently in a horizontal plane. The device may also be provided with fixed eyelets such as 27 and 28 for guiding the yarn to and from the device.

The device operates as follows:

A yarn 29 is fed from a cone (not shown) through eyelet 27 and eyelet 25 and is then given one or more turns around cage 1, depending upon the amount of pull required, after which it is passed through eyelets 28 and 22 and from which it proceeds to whatever yarn tension device (not shown) is employed for establishing the tension desired at the needle receiving point.

Cage 1 rotates at a constant speed in the direction to pull the yarn from the cone and feed it in the direction of the needles. In Fig. 1 this would be from left to right.

When the machine to which the device is attached is knitting, the yarn runs from the cone beyond eyelet 27 through the feeding device and to the needles beyond eyelet 22. Take-up 21 will assume the position shown in Fig. 1 or some other position above or below this depending upon the tension on yarn 29. The position of arm 21 determines the position of arm 24 and eyelet 25 in relation to cage 1. More specifically, if arm 21 is pulled up by yarn 29 gear 16 will be rotated in counter-clockwise direction by rod 19. This will rotate gear 15 from right to left and will swing arm 24 and eyelet 25 around cage 1 in the same direction. This will increase the amount of yarn wound around cage 1 and, consequently, the amount of drag upon yarn 29 on the cone side of cage 1. Therefore, yarn will be fed faster from the cone. This increase in the feeding rate from the cone will decrease the tension of yarn 29 on the machine side which will cause take-up 21 to

drop somewhat. This will result in a rotation in the opposite direction of arm 24 and eyelet 25 and an equivalent decrease in the length of yarn in contact with cage 1. Therefore, the drag of cage 1 upon the yarn is decreased.

Whenever cage 1 tends to feed yarn from the cone at a faster rate than that required by the machine, take-up 21 will drop to its lowest position at which the shortest length of yarn will be in contact with cage 1 and the drag of cage 1 at its minimum. If the cage still feeds yarn faster than it is consumed, a slack in the yarn will result between the cage and the regular yarn tension, positioned between the device and the needles, which slack will eliminate substantially all of the friction between the yarn and cage 1 which thereupon ceases to operate as a yarn feeding device until the slack is taken up and the tension again increased sufficiently to cause the cage to draw yarn from the cone. In this way, a constant adjustment of the amount of yarn drawn from the cone by the device is automatically obtained.

The number of turns of the yarn around cage 1 can be varied depending upon the character of yarn and its frictional relation to cage 1. They should be enough to cause cage 1, which rotates at a constant speed to draw from the cone whatever yarn is being used fast enough to meet all of the requirements of the knitting machine. As a practical matter cage 1 should be capable of drawing the yarn from the cone at a somewhat greater rate than it can be consumed by the machine under any conditions. Otherwise, there may be an insufficiency of yarn fed at some time. Any over feeding is promptly eliminated, as already described, by the production of a slack which eliminates or reduces the feeding capacity of the cage.

Preferably take-up arm 21 is provided with a weight 30 which can be positioned at any desired point upon it. In this way, the balance of all the parts operated by yarn 29 can be adjusted to insure that arm 21 will drop quickly when the tension on the yarn decreases and also that the weight of arm 21 will not be too great so as to interfere with the tensioning of the yarn by the usual tensioning device, for example.

All of the parts operated by yarn 29 including take-up 21, rod 19, arm 24 and pin gears 15 and 16 should be as light and frictionless as possible in order to reduce to a minimum the effect of their weight and inertia upon the yarn and to make them as responsive as possible to variations in yarn tension.

It will be understood, of course, that the form of this device may be changed considerably from that shown in the drawing without departing from its essential characteristics. For example, if desired, pivot 23 of take-up 21 might be at its extreme left end 20 in which case rod 19 would connect with it at some point such as the present pivot 23. Then counterweight 30 would probably be positioned upon an extension of arm 21 to the left of end 20. The purposes of this weight being to secure the desired balance between the associated parts it can be placed wherever it will accomplish its purpose and may even be omitted if the parts are properly balanced without it. The advantage of the weight is that the device may be accommodated more accurately to different yarns and different conditions which may exist both on the bone and knitting machine sides of the device.

It is desirable that a feeding device of this kind be provided for each yarn. If so, the unit may be duplicated and driven from the same or a separate source of power. In Fig. 1, a second belt 31 is shown connected to a pulley 32 assumed to be a duplicate of pulley 6, a part of another similar yarn feed device. Belt 31 may be assumed to run to a suitable sort of power, probably the same as for belt 7, since this insures that both devices operate at the same speed.

One of the most useful characteristics of this device as compared with the majority of other devices for the same purpose is that the speed of rotation of cage 1 is constant even when it is not effective to draw yarn 29 from the cone so that no problems of starting, stopping or speed variation for different requirements are present.

I claim:

1. A yarn feeding device comprising an essentially cylindrical cage about which the yarn can be wrapped, said cage being rotatably mounted upon a vertical axis, means for rotating the cage at a substantially constant speed, a gear above said cage rotatable in a vertical plane, a second gear meshing with said first mentioned gear rotatable in a horizontal plane, means associated with said last mentioned gear for varying the length of yarn wrapped around said cage and yarn controlled means for operating said first mentioned gear and, through it, said means for varying the length of yarn wrapped around said cage.

2. A yarn feeding device comprising a positively driven, essentially cylindrical cage about which a yarn can be wrapped, a fixed yarn guiding eyelet adjacent one end of said cage, a yarn guide eyelet adjacent the other end of said cage and swingable around said cage and means controlled by said yarn for swinging said last mentioned eyelet around said cage in either direction.

3. A yarn feeding device comprising two circular spaced heads connected by rods equally spaced around and adjacent to the periphery of said heads to form an essentially cylindrical cage around which a yarn can be wound, means for rotating said cage at a substantially constant speed, means provided with a yarn guiding eyelet mounted on a swivel and adapted to be swung around said cage to vary the feeding rate by varying the length of yarn in contact therewith and yarn controlling means for operating said last mentioned means.

4. A yarn feeding device comprising a positively driven, essentially cylindrical cage about which a yarn can be wrapped, a yarn guiding eyelet adjacent one end of said cage and swingable around said cage and means controlled by said yarn for swinging said last mentioned eyelet around said cage in either direction.

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