May 29, 1962 J. C. CUNDIFF 3,036,448

DEVICE FOR PRODUCING NOVELTY PATTERNS

Filed Aug. 17, 1959 3 Sheets-Sheet 1

Fig. 5.

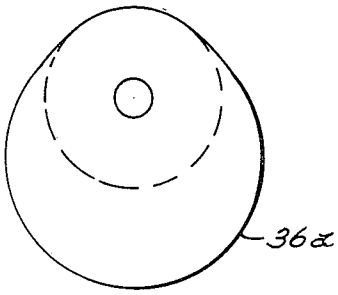


Fig. 6.

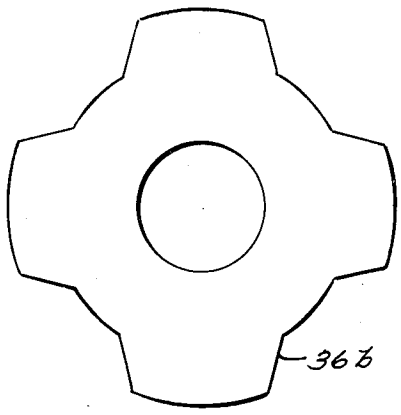


Fig. 7.

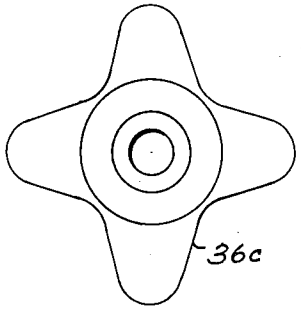


Fig. 8.

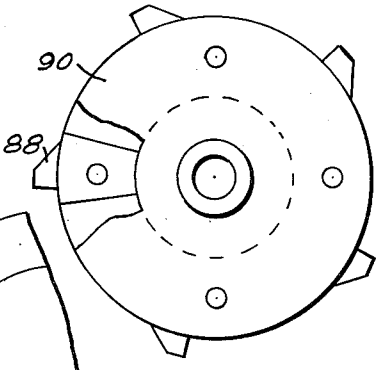
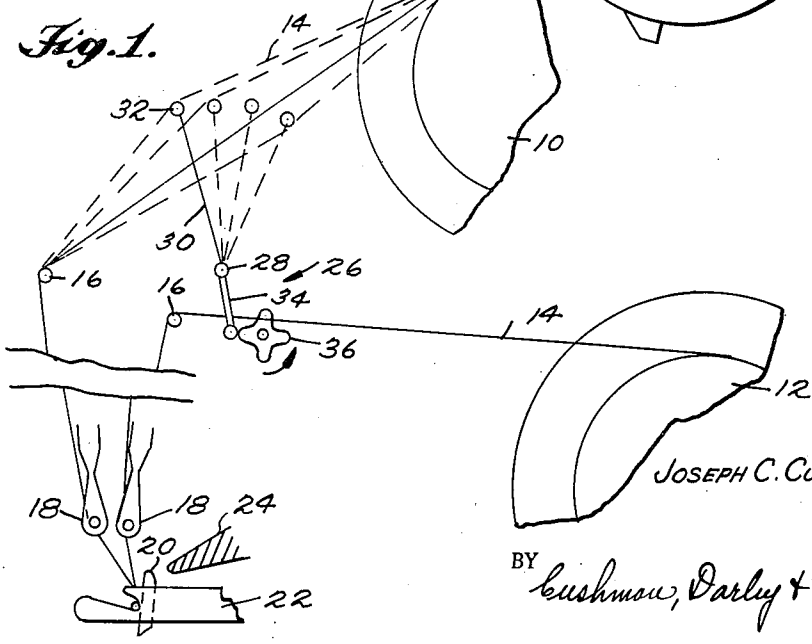


Fig. 1.



INVENTORS
JOSEPH C. CUNDIFF

BY Cushman, Darby & Cushman
ATTORNEYS

May 29, 1962 J. C. CUNDIFF 3,036,448

DEVICE FOR PRODUCING NOVELTY PATTERNS

Filed Aug. 17, 1959 3 Sheets-Sheet 2

Fig. 2.

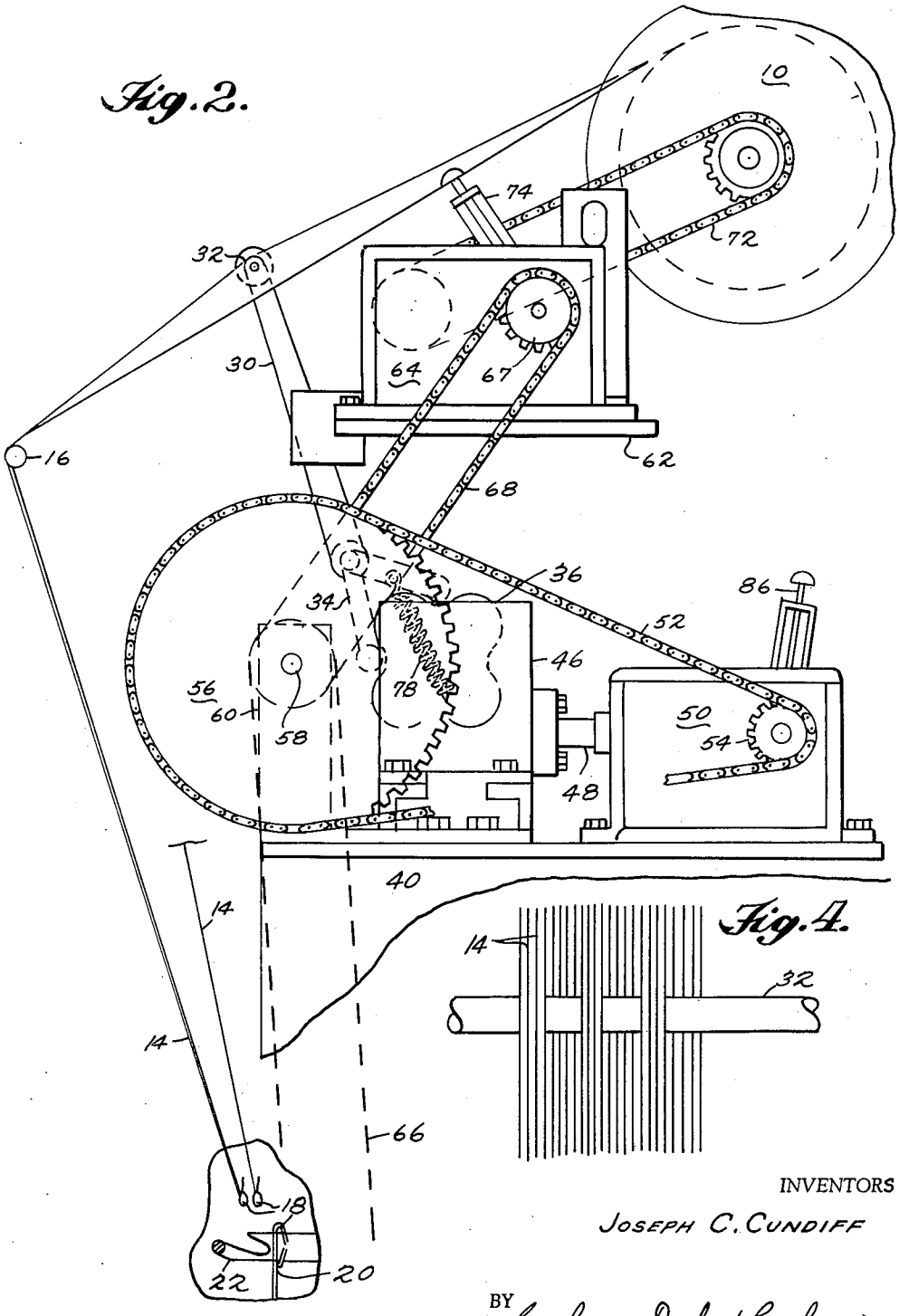


Fig. 4.

INVENTORS

JOSEPH C. CUNDIFF

BY Cushman, Darby & Cushman

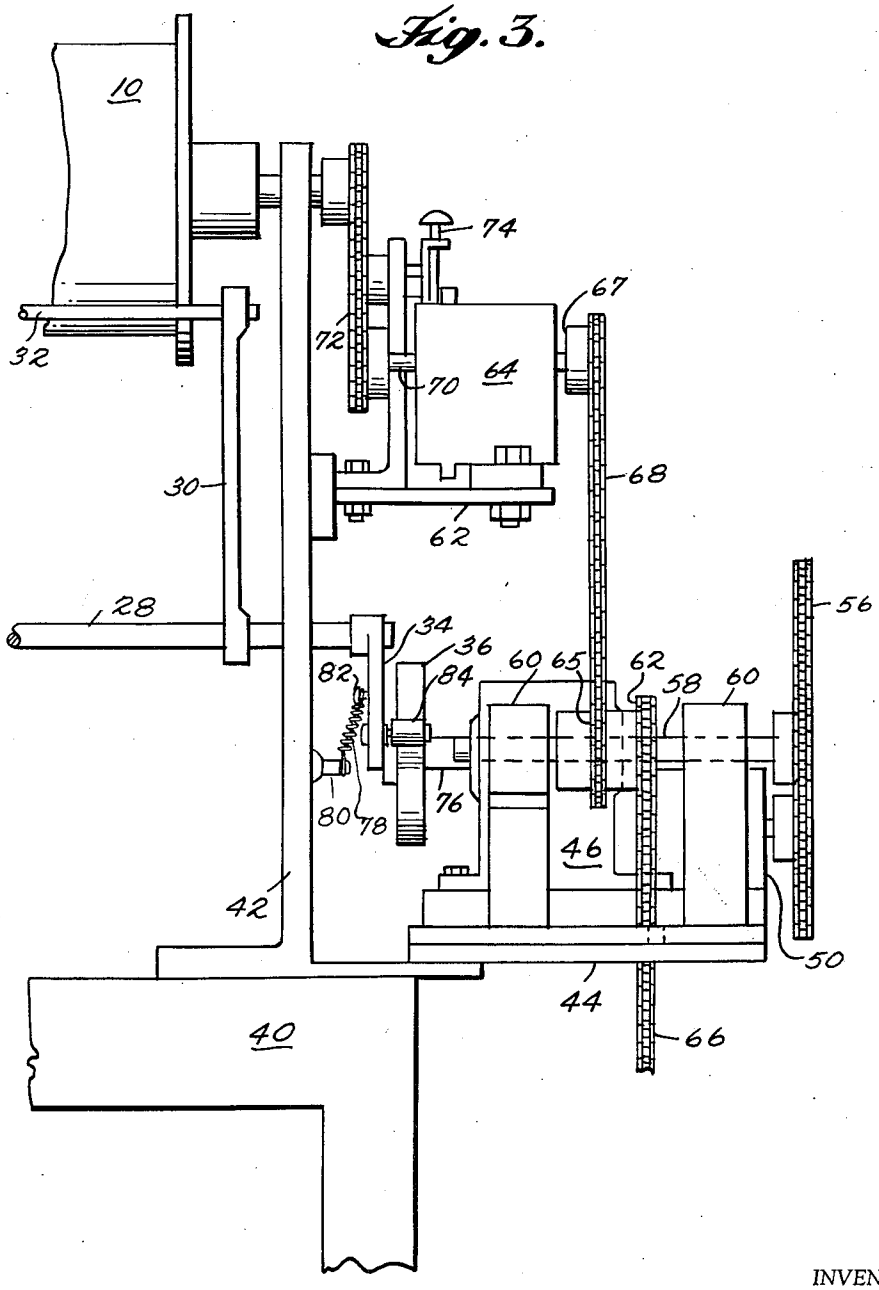
ATTORNEYS

May 29, 1962 J. C. CUNDIFF 3,036,448

DEVICE FOR PRODUCING NOVELTY PATTERNS

Filed Aug. 17, 1959 3 Sheets-Sheet 3

Fig. 3.



INVENTORS

JOSEPH C. CUNDIFF

BY Cushman, Darby & Cushman

ATTORNEYS

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DEVICE FOR PRODUCING NOVELTY PATTERNS

Joseph C. Cundiff, Asheboro, N.C., assignor to Burlington Industries, Inc., Greensboro, N.C., a corporation of Delaware

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3 Claims. (Cl. 66—86)

This invention relates to warp knitting machines such as high speed tricot machines, and more particularly to knitting machines having a top warp yarn supply and a bottom warp yarn supply.

In particular the invention relates to a device for producing novelty patterns in the fabric knitted by the machine by varying the tension of selected top warp yarns at selected intervals during the knitting process.

In tricot knitting machines and the like, a plurality of or sheet of yarns is withdrawn from top and bottom warp supply beams and fed along predetermined paths over normally stationary yarn tensioning tubes to the knitting needles and sinkers. The present invention provides a device which may be interposed between the top warp supply beam and its associated tensioning tube, so that varying degrees of tension may be applied to preselected strands or groups of strands of the top warp in order to produce novel patterns in the knitted fabric.

A principal object of the present invention is to provide a device which may be employed in combination with a warp knitting machine, such as a high speed tricot machine, to produce a wavy pattern-like effect in the knitted goods.

Another object of the invention is to provide means adapted to produce a pattern effect in warp knitted goods, wherein the pattern imparted may be readily and quickly varied or changed.

A further object is to provide an oscillating yarn tensioning rod for varying the tension of preselected strands or groups of strands of the top warp of a double guide-bar tricot knitting machine, so as to produce novel effects and patterns in the material being knitted thereby. Further objects will be in part evident and in part pointed out hereinafter.

The invention and the novel features thereof may best be made clear from the following description and the accompanying drawings in which:

FIGURE 1 is a schematic view illustrating the operation and principle of the present invention.

FIGURE 2 is a side elevational view of an exemplary device in accordance with the present invention.

FIGURE 3 is an end elevational view of the yarn tensioning device, as viewed from the left of FIGURE 2.

FIGURE 4 is a fragmentary view of the yarn tensioning rod, showing the warp yarns leased thereover.

FIGURE 5 is a side elevational view of an actuating cam useful in the present invention.

FIGURE 6 is a side elevational view of an alternative cam which may be used.

FIGURE 7 is a side elevational view of an additional form of cam, and

FIGURE 8 is a side elevational view, partially broken away, illustrating a special segmental cam which may be employed.

In the drawings, FIGURE 1 represents a tricot knitting machine of the double warp type, to which the present invention has been applied. The knitting machine is provided with the top warp yarn supply **10** and the bottom warp yarn supply **12**. The warp yarns **14** are fed from the yarn supplies over the usual yarn tension tubes **16**, and therefrom through yarn guides **18** to the needles **20**, which cooperate with the sinkers **22** and presser member **24** in the usual manner to knit fabric.

The device of the present invention, indicated generally as **26**, is interposed between the top warp yarn supply **10** and the associated yarn tension tube **16**.

The device **26** includes a shaft **28** from which arms **30** extend radially, the arms **30** supporting at their outer ends a warp yarn tensioning rod **32** disposed adjacent the path of the yarn threads **14** extending from the top warp yarn supply **10**. As shown in FIGURE 4, the yarn threads **14** may be leased about the rod in any predetermined manner, such as 4 under, 4 over or the like, and it will be understood that the leasing may be varied in accordance with any desired combination, in order to produce varying pattern effects. A crank arm **34** extends from one end of the shaft **28** into cooperative relationship with a cam **36**. As the cam rotates, in a manner described below, the crank arm **34** cooperating therewith causes the shaft **28** to oscillate, and this oscillating movement is transmitted by the arms **30** to the tensioning rod **32**. Oscillation of the rod **32** moves the warp strands or groups of strands leased thereover out of the normal feed path to the tension tube **16**, whereby the tension of individual strands or groups of strands is periodically and variably altered in accordance with a predetermined sequence or pattern. The variance in the tension of threads on the top warp yarn as it passes into the knitting elements of the machine produces a wavy or pattern-like effect in the knitted fabric.

In detail, referring to FIGURES 2 and 3, the device is secured to the frame of a tricot knitting machine **40** by the vertical supports **42** secured thereto in any suitable manner. A supporting plate **44** upon which drive elements are mounted is secured to support **42** and extends horizontally outwardly from the knitting machine frame. Disposed upon the plate **44** is a transmission unit **46** connected by a shaft **48** to a speed varying device **50**. The speed varying device **50** is driven by means of the chain **52** engaging the sprocket **54** thereof, and the sprocket **56** supported by the shaft **58** and bearings **60** mounted on the plate **44**. Also secured to the shaft **58** are sprockets **62** and **65**. The sprocket **62** is driven by the chain **66** which is in turn driven from the main camshaft (not shown) of the tricot knitting machine, and causes the shaft **58** and the sprockets secured thereto to rotate at a speed coordinated with the machine drive.

Located above the aforementioned elements and secured to the vertical support **42** is a horizontally extending support plate **62** upon which is mounted a second speed varying device **64**. The speed varying device **64** is driven by shaft **58**, by means of the sprocket and shaft **67** which are caused to rotate by the chain **68** driven by the sprocket **65** secured to the shaft **58**. The output shaft **70**, by means of the chain and sprocket **72**, causes the top warp supply beam **10** to rotate in order to feed the top warp threads **14** during the knitting process. The output speed of the shaft **70** may be varied to vary the rate of feed of the yarn by adjusting the control lever **74** of the transmission device **64**.

The lower transmission unit **46**, which is driven by the shaft **48** of the lower speed varying device **50** is provided with an output shaft **76** to which is removably secured at one end thereof the actuating cam **36**. The actuating cam **36** cooperates with crank arm **34** which is secured to one end of the shaft **28** of the tensioning device. Shaft **28** is journalled in the vertical support **42** and has radially extending arms **30** fastened thereto, with the arms **30** supporting the thread tensioning rod **32** between their outer ends. The crank arm **34** is spring biased against the face of the cam **36** by means of the coil spring **78**, which is fastened at one end to the support **42**, as by the pin **80**, and is likewise secured to the crank arm **34**, as by the pin **82**. The free end of the

crank arm **34** is provided with a cam following roller **84** which rides the face of the cam **36**, so that as the cam rotates the crank arm **34** is caused to oscillate in response to the cam surface causing the shift **28** to oscillate which in turn transmits an oscillating motion, through the arms **30**, to the thread tensioning rod **32**. The speed of rotation of the cam may be varied by moving the control lever **86** of the lower speed varying device **50**, in order to change the relative frequency of oscillation of the tensioning rod **32**. The crank arm **34** may be adjustable so that it may assume either of the two positions shown in FIGURE 2, relative to the cam.

FIGURES 5 through 7 disclose various shapes of simple cams, **36***a*, **36***b* and **36***c* which may be employed to oscillate the tensioning rod **32**. FIGURE 8 discloses a segmental type cam in which the cam segments **88** may be disposed at varying positions about the cam wheel **90**, and replaced by segments of different shape. As will be understood, the frequency and amplitude of the tensioning rod oscillation may be readily varied by changing the cam **36**, or by changing the number and/or type of segments **88** in the cam wheel **90**.

In operation, the device obtains its driving motion from the main camshaft of the knitting machine through the chain **66**, which drives the sprocket **62** and shaft **58** and thereby the upper and lower speed varying devices. The top warp **14** is fed thereby at a predetermined and adjustable rate, and the tensioning device **26** is oscillated similarly at a predetermined and adjustable rate, whereby the tension on individual strands or groups of strands of the top warp is intermittently varied.

As will be understood, an infinite variety of patterns may be imparted to the fabric being knitted. Initially, a factor of variance may be introduced by selection of the lease pattern of the top warp threads over the tensioning rod **32**. As previously indicated, another factor of variance is introduced by choice of the cam **36**, and the pattern frequency may be readily varied by adjustment of the control lever **86**, whereby the relative speed of the cam is controlled. Additionally, the tensioning rod may be arranged to periodically elevate the overlying yarns, or its stroke may be such as to periodically elevate the overlying yarns and periodically depress the underlying yarns as well.

Various other expedients may be utilized to further vary the unusual and unique effects achieved. For example, the warp strands may be of different size or type. It is to be noted that usually the heavier the yarn, the more clearly defined will be the impression created in the knitted fabric by variation of the yarn tension.

The device of the present invention has been illustrated and described in connection with the top warp only, this being most easily applied to high speed tricot knitting machines. It will be recognized, however, that the invention may be applied to the bottom warp only, or in

such cases to both warps. In the embodiment illustrated, the bottom warp is fed to the yarn guides in the customary manner, the lower warp supply beam being either gear driven or controlled by a conventional brake let-off.

It will thus be seen that there has been provided by this invention a structure in which the various objects hereinbefore set forth, together with many practical advantages, are successfully achieved. As various possible embodiments may be made of the mechanical features of the above invention, all without departing from the scope thereof, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative, and not in a limiting sense.

What is claimed is:

1. In combination with a warp knitting machine having a top warp yarn supply and a bottom warp yarn supply, a variable tensioning device for said top warp yarn, said tensioning device being mounted upon the frame of said warp yarn knitting machine and cooperating with said top warp yarn supply, said tensioning device including a shaft, arms secured to said shaft, a top warp yarn tensioning rod carried by said arms with the warp yarns leased about the rod, a crank arm secured to one end of said shaft, a cam cooperating with said crank arm, common drive means for said top warp yarn supply and said cam to feed said top warp yarn and to drive said cam to oscillate said crank arm and thereby said shaft and said top warp yarn tensioning rod across the path of said top warp yarn to vary the tension of said top warp yarn to produce novelty patterns in the knitted fabric, and means to vary the speed of said cam drive with respect to the top warp yarn drive to vary the novelty patterns produced.

2. Apparatus as defined in claim 1, wherein said means to vary the speed of said cam drive with respect to the top warp yarn drive is a variable speed transmission in the drive to said cam.

3. Apparatus as defined in claim 1, wherein said cam means is removable and replaceable.

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