Sept. 29, 1970 R. PARSONS 3,531,033

FEEDING OF YARNS

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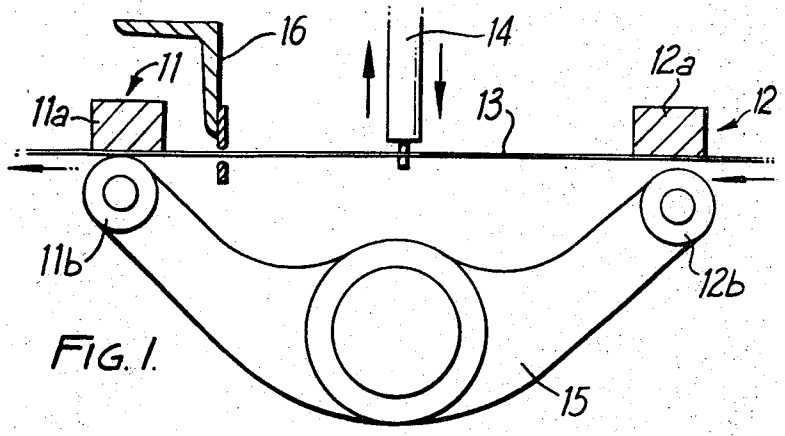


FIG. 1.

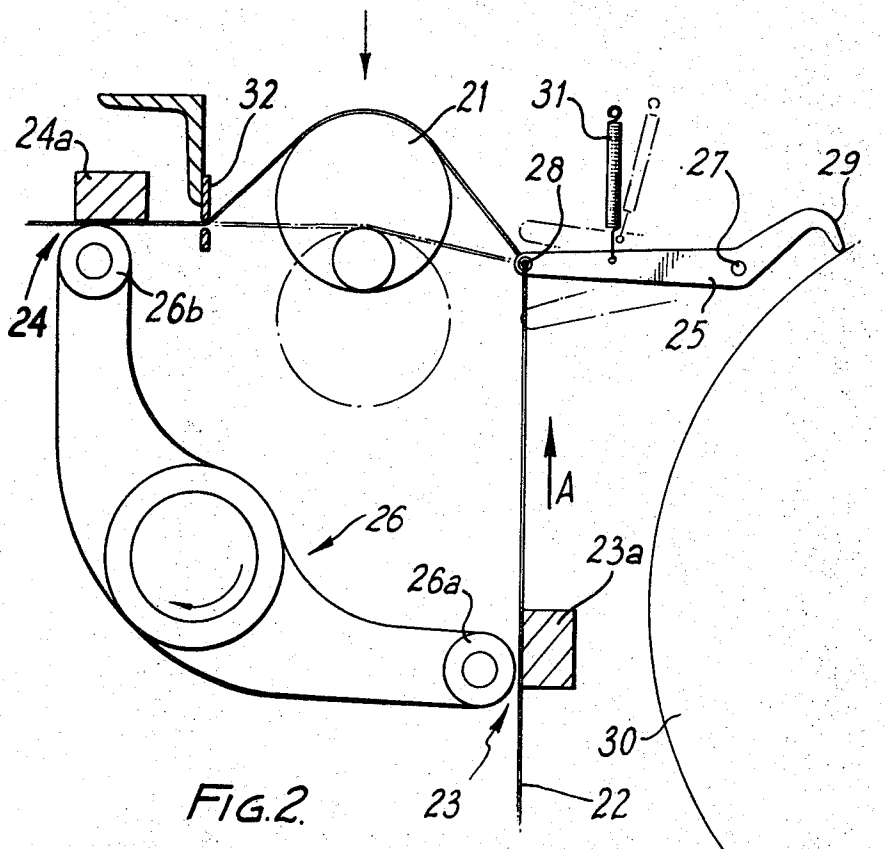


FIG. 2.

INVENTOR:
Ronald Parsons

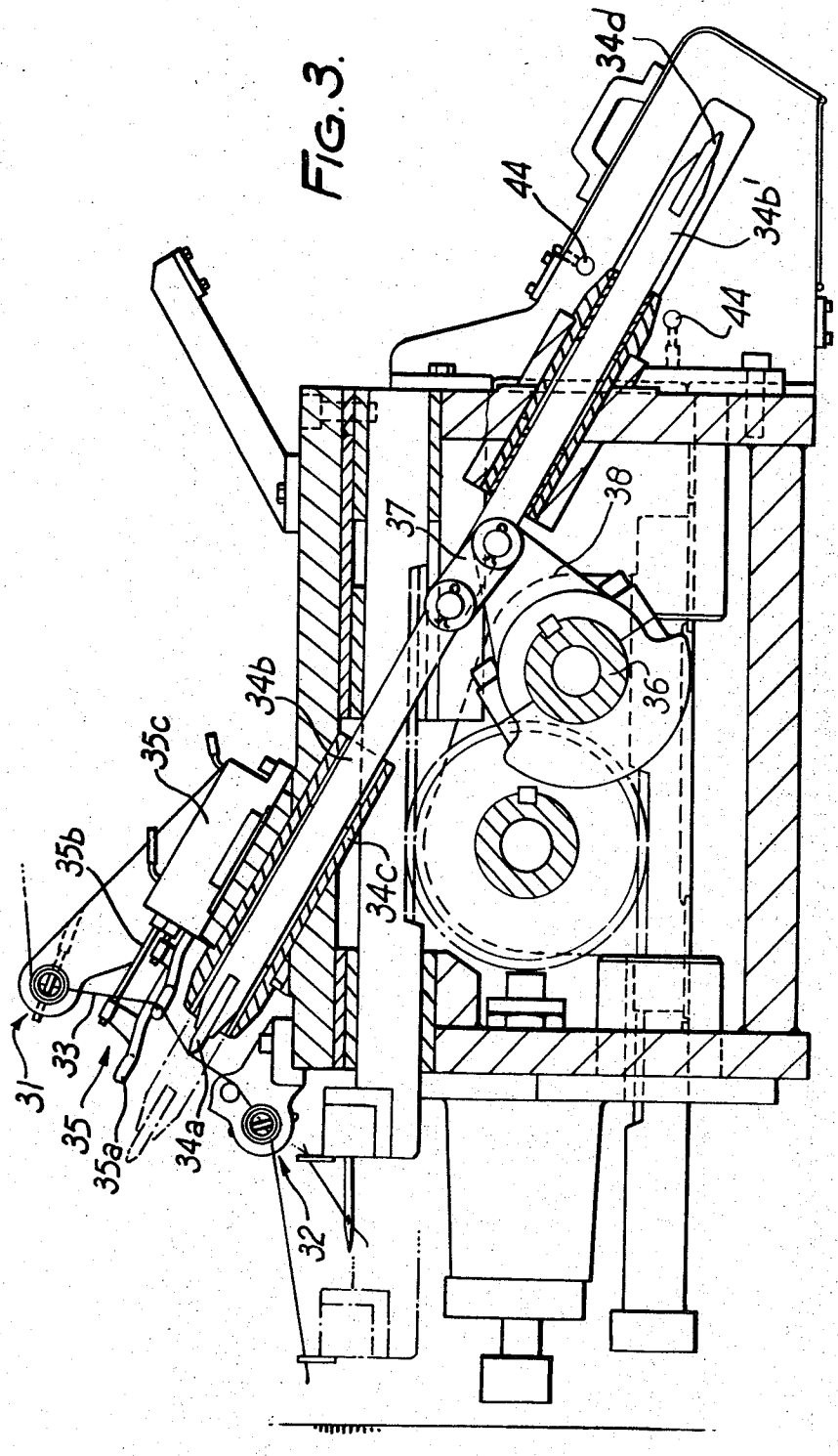
BY

ATTORNEY

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FIG. 3.



INVENTOR:
Ronald Parsons
BY
ATTORNEY

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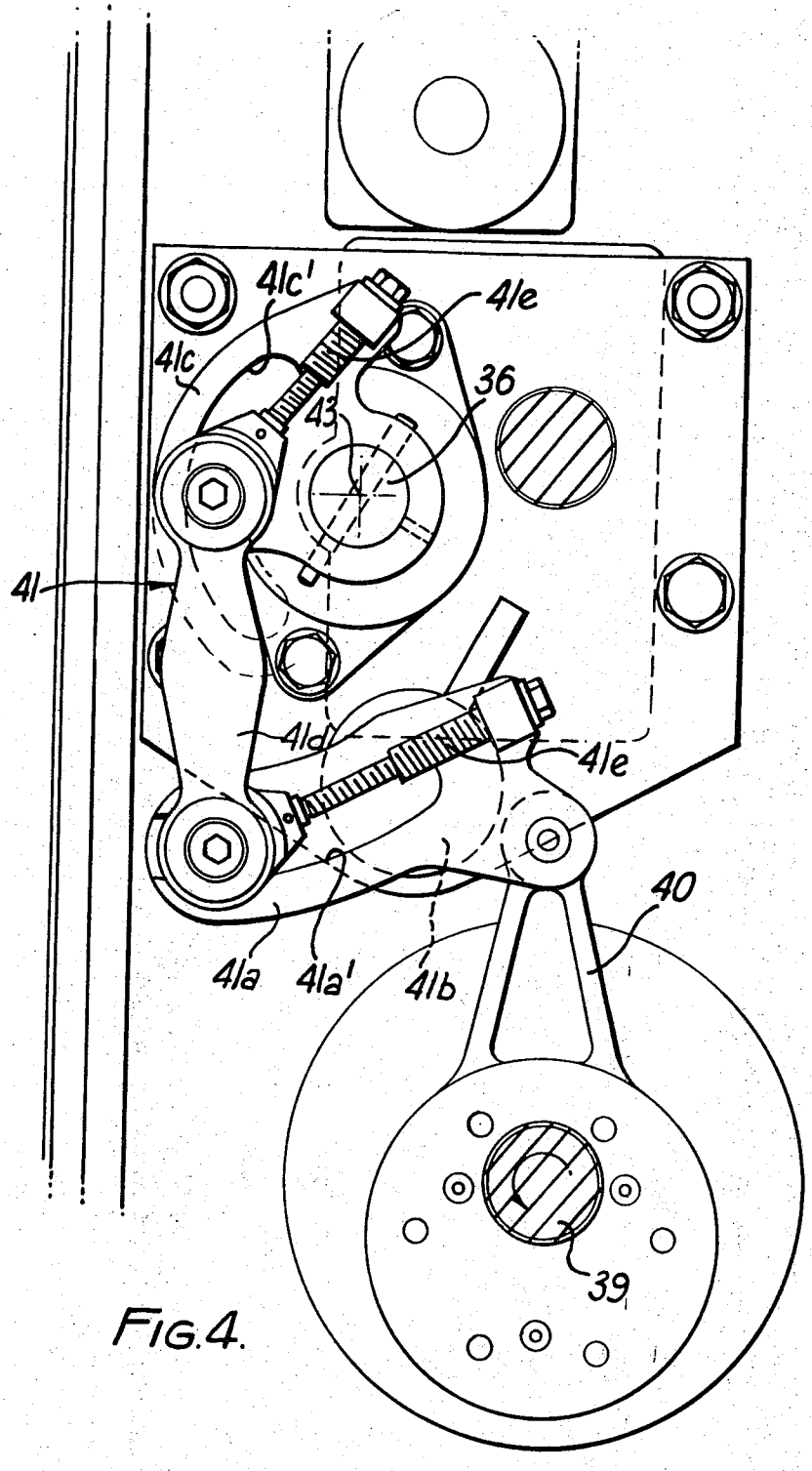


FIG. 4.

INVENTOR:
Ronald Parsons

BY

ATTORNEY

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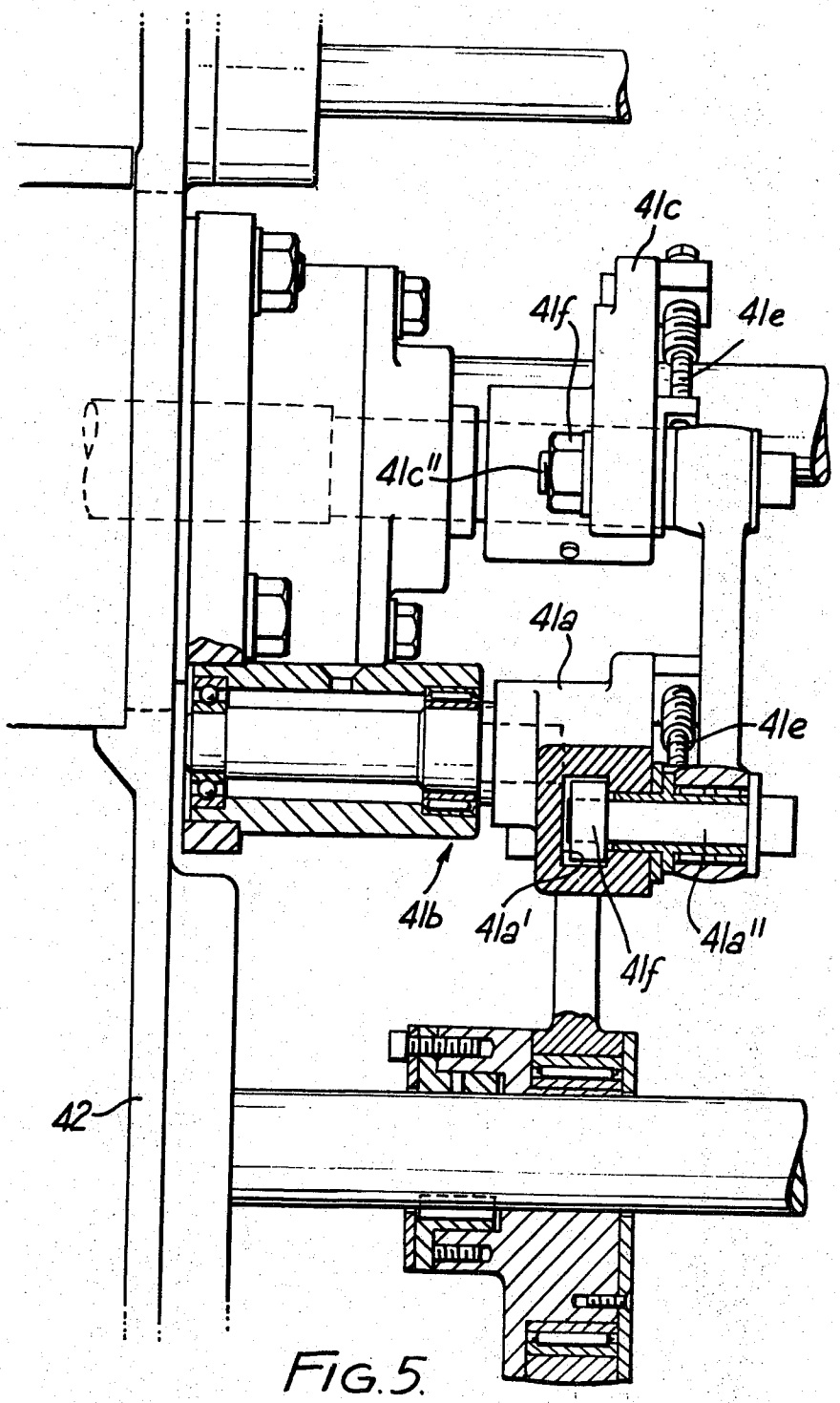


FIG. 5.

INVENTOR:
Ronald Parsons

BY

ATTORNEY

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FEEDING OF YARNS

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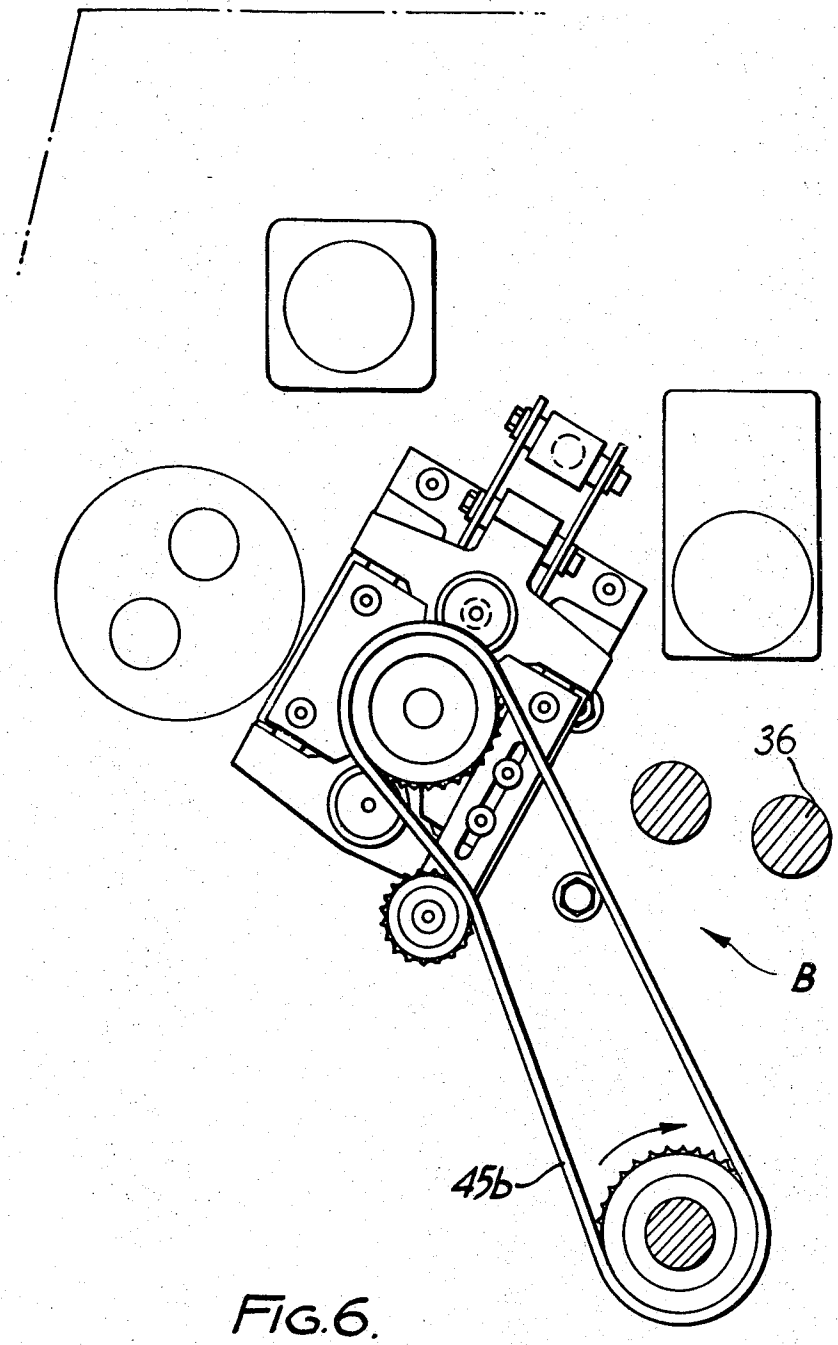


FIG. 6.

INVENTOR:
Ronald Parsons
BY
ATTORNEY

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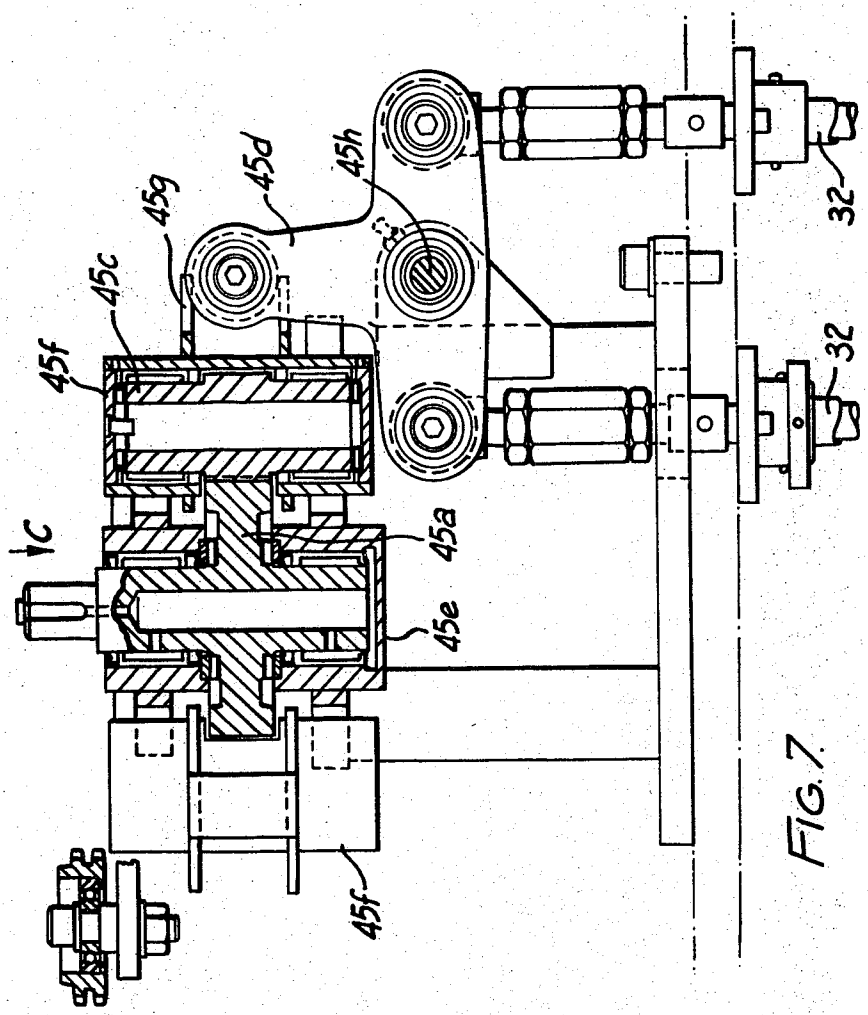


FIG. 7.

INVENTOR:
Ronald Parsons

BY

ATTORNEY

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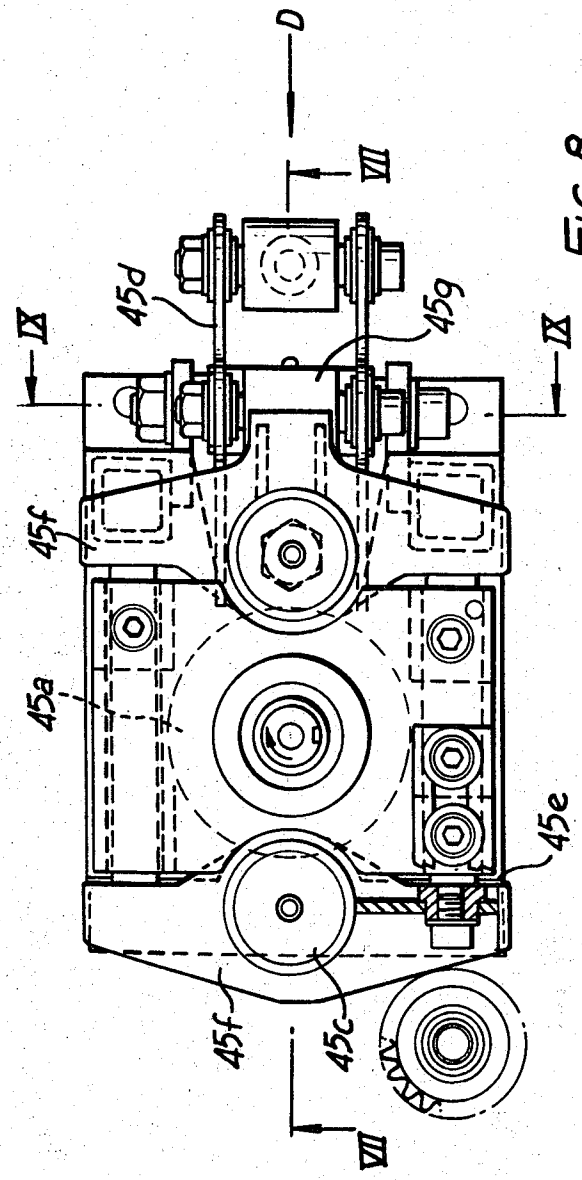


FIG. 8.

INVENTOR:
Ronald Parsons

BY

ATTORNEY

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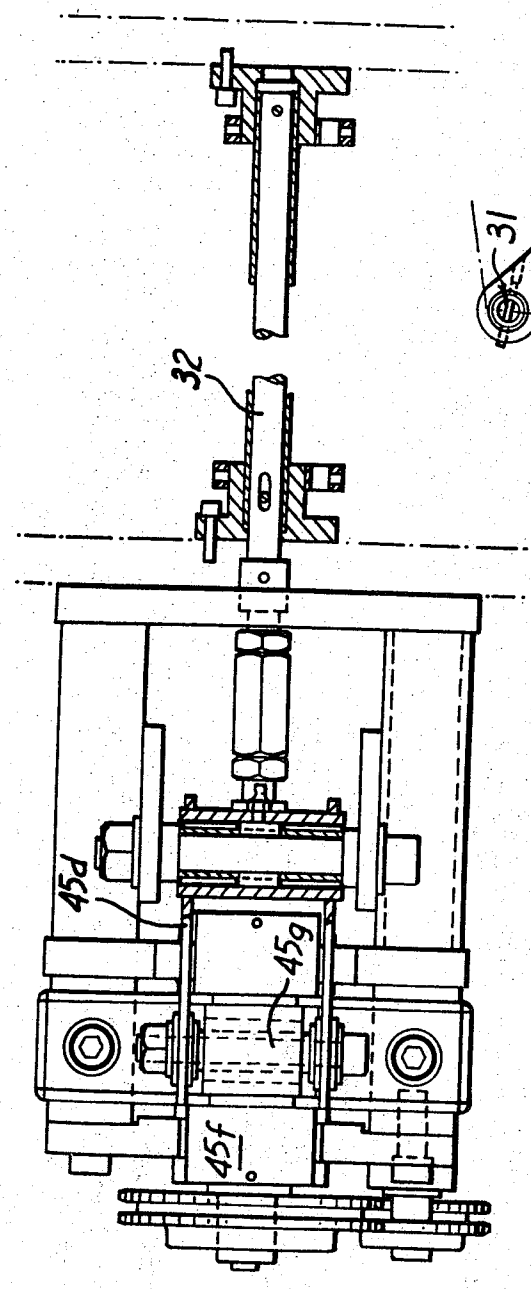


FIG. 9.

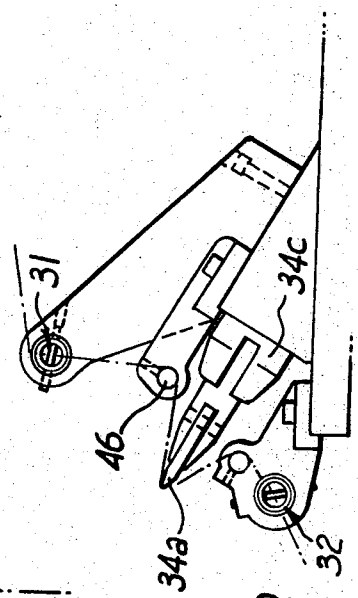


FIG. 10.

INVENTOR:
Ronald Parsons

BY

ATTORNEY

United States Patent Office 3,531,033 Patented Sept. 29, 1970

3,531,033

FEEDING OF YARNS

Ronald Parsons, Rishton, Blackburn, England, assignor to Singer-Cobble Limited, Blackburn, England

Filed Apr. 19, 1968, Ser. No. 722,679
Claims priority, application Great Britain, Apr. 19, 1967, 17,904/67
Int. Cl. B65h 17/42
U.S. Cl. 226—8 2 Claims

ABSTRACT OF THE DISCLOSURE

According to the present invention a method of feeding yarn comprises passing such yarn through spaced, selectively operable, stop means, and subjecting the yarn at a position between such means, to a transverse displacement thereby to vary the yarn path length between the said means, the yarn being drawn from a supply thereof through the first such stop means upon transverse displacement of the yarn, the other stop means being closed, and such yarn being drawn from the space between the stop means through the said other stop means when the means effecting the displacement is withdrawn from its position of extreme displacement and the first stop means is closed.

The invention concerns the feeding of yarns and has especial reference to a method of and a means for feeding yarns to a tufting machine particularly, but not exclusively when a variation in pile height in the tufted end product is required.

The primary object of the present invention is to provide an improved method of and a means for feeding yarn to a tufting machine which will allow of the production of a range of pile heights in a tufted product in a simple and reliable manner.

Preferably the yarn will be subjected to a transverse displacement of a variable amount thereby to allow of a variation in the rate of feed of yarn.

In one arrangement the yarn is transversely displaced at each of a number of spaced locations thereon.

The invention also includes apparatus for practicing the method aforesaid which comprises spaced stop means between which the yarn extends and through which the yarn passes, and a displacement means located intermediate the said stop means and engageable with yarn passing therebetween, that stop means furthest in the direction of feed of the yarn being actuable to clamp yarn passing therethrough during advancing movement of the displacement member whilst the other stop means remains open the conditions of the respective stop means being adapted to be interchanged during part at least of the reversing movement of the said member.

Preferably, the apparatus includes a second displacement means for patterning purposes, and thus according to a further feature of the invention a yarn feed device comprises a member adapted to engage the yarn and to effect a transverse displacement thereof, yarn stop means arranged one at each side of the said member and adapted respectively to act on the yarn at each such side, and a pattern control mechanism adapted to act on the yarn between the said member and one of the stop means, the said stop means being operable alternately so as to allow of the withdrawal of yarn from a supply source by the said member during a part of the machine cycle whilst simultaneously preventing withdrawal of yarn from the area between the stop means during the same period and to allow of the withdrawal of yarn from the area between the said stop means during another part of the machine cycle whilst simultaneously preventing withdrawal from the supply source, the said pattern control mechanism being adapted, for a constant amplitude of movement of the feed device, to vary the maximum path length between the stop means independently of such feed device.

The invention will now be described further by way of example only, with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic representation of a first form of feed means;

FIG. 2 is a corresponding view of a second such means;

FIG. 3 is a transverse view, partly in section of a feed device constructed in accordance with the invention as applied to a tufting machine;

FIG. 4 is an end elevation of a part of the machine and shows the drive coupling for the yarn displacement means, the view being taken in a direction opposite to that of FIG. 3;

FIG. 5 is a side elevation partly in section, of the drive coupling of FIG. 4;

FIG. 6 is an end elevation, looking in the opposite direction to that of FIG 4, of the machine and shows the yarn clamp operating mechanism;

FIG. 7 is a view, partly in section, taken in the direction of arrow B of FIG. 6;

FIG. 8 is a view taken in the direction of arrow C of FIG. 7; and

FIG. 9 is a view taken in the direction of arrow D of FIG. 8; and

FIG. 10 is a diagrammatic end elevation of an alternative embodiment to that of FIGS 3 to 9 wherein the patterning mechanims is replaced by a fixed guide means.

Referring now to the drawings, and particularly to FIG. 1 thereof, a yarn feed means comprises two spaced yarn claimps **11**, **12** between and through which a yarn **13** extends, and a reciprocable displacement member **14** engageable with the yarn and adapted, upon reciprocation, to effect a displacement thereof. The yarn clamps comprise fixed clamp blocks **11***a*, **12***a* each of which co-operates with a respective movable clamp member **11***b*, **12***b* the said clamp members being formed on a common pivoted lever **15**. Yarn guides, such as guide **16**, may be provided if desired.

In practice yarn is drawn from a supply source thereof, say a creel (not shown) into the region lying between the clamps **11**, **12** by movement of the member **14** transversely of the yarn the clamp **11** being closed to prevent withdrawal of yarn from beyond such clamp. Upon completion of the movement of the member **14** the clamp **11** opens and the clamp **12** closes, the yarn thus being capable of being drawn through clamp **11**, as by the needles of the tufting machine (not shown). At a subsequent stage in the cycle of operation of the tufting machine the forward clamp **11** again closes, the arrangement reverting to its condition at the commencement of the cycle. If desired synchronism of the operation of the clamps **11**, **12** is such that for a period of time both clamps are closed so as to avoid the direct withdrawal of yarn from the creel by the needles.

In the second embodiment, see now FIG. 2, a yarn feeding device comprises a movable feed member **21** arranged to move in synchronism with the tufting machine cycle to engage a yarn **22** and to withdraw a quantity of same from a supply thereof, say a creel (not shown), yarn clamps **23**, **24** arranged one at each side of the said feed member **21** and spaced apart therefrom, and a pattern finger **25** extending to a position intermediate the feed member **21** and the yarn clamp **23**, the said pattern finger **25** engaging the yarn **22** and being adapted, upon movement between various positions thereof, to vary the path length between the yarn clamps **23**, **24**.

The feed member **21** comprises an eccentrically mounted roller about a part of the circumference of which the yarn **22** passes, the said roller being driven in synchronism with the tufting machine from the main shaft thereof and being arranged, upon each rotation, to draw yarn from the creel. The roller is mounted for adjustment of position into or out of the path of yarn moving from the finger **25** to the second yarn clamp **24**.

The yarn clamps **23**, **24** are arranged to work in opposition one to the other, one clamp being operative whilst the other is inoperative, and vice versa. Conveniently, a pivotally mounted lever **26** may be utilised, the said lever being movable between a first position in which a first part **26***a* thereof is in contact with the block **23***a* of clamp **23** thus to secure the yarn thereagainst, the other end of the lever being spaced from the block **24***a* of the other clamp, and a second position in which another part **26***b* thereof is in contact with the block **24***a* the first part **25***a* of the lever, in the said second position, being spaced from its associated block **23***a*. In some circumstances it may be found to be desirable so to arrange the operation of the clamps that there does exist an overlap of the clamping function thereof. If required the yarn clamps are independant and one such clamp is movable in the longitudinal direction of the yarn so as to provide a further facility for patterning or variation in path length.

The pattern finger **25** is of bell-crank shape and is mounted on pin **27** so as to be pivotal about an axis parallel to that of the roller **21**. One end of the finger **25** is apertured to form an eye **28** through which the yarn **22** passes, whilst the other end of the said lever defines a pattern follower **29** which moves in contact with the surface of a pattern drum **30**. The pattern follower **29** is loaded into contact with the surface of the drum **30** by a helical spring **31**.

A yarn guide **32** is provided between the feed roller **21** and the clamps **24**.

The normal sequence of operation is for the pattern finger **25** to assume a position as determined by the pattern drum **30** and for that clamp **23** disposed between the feed roller **21** and the creel to be open. The other clamp **24** is closed.

As the roller **21** revolves, so the path length between the open and closed clamps **23**, **24** increases and thus yarn **22** is withdrawn from the creel in the direction of the arrow A. Upon completion of the withdrawal of the yarn from the creel, the previously open clamp is closed and vice versa. The motion of the tufting needles draws yarn from that made available by the roll from the creel, and deficiency in yarn being made up by pulling back yarn from the previously inserted loop in conventional manner.

By adjusting the position of the finger **25** according to the drum **30**, so the maximum yarn path length between the two clamps is varied and hence the amount of yarn with-drawn from the creel by the roll during a machine cycle is adjusted to give a different amount of "pull back" and as a result, a different pile height.

A typical transverse section through the relevant parts of a tufting machine having a feed means constructed in accordance with the invention is shown in FIGS. 3 to 9. Referring now particularly to FIG. 3, the feed means comprises spaced yarn clamps **31**, **32** through and between which the yarns **33** pass, a reciprocable displacement member **34** movable to engage the yarn and to effect a transverse displacement of the yarn between the clamps, and a patterning mechanism **35** arranged to introduce a further variation in the path length between the clamps according to a predetermined pattern.

The yarn clamps **31**, **32** each comprise an inner sleeve **31***a*, **32***a* (FIG. 9) movable axially of a closely fitting outer sleeve **31***b*, **32***b*, the yarn passing diametrically through the two said sleeves through aligned holes therein. Upon relative displacement of the inner and outer sleeves to move the corresponding holes in each such

sleeve out of alignment the yarn is trapped by the sleeves thereby to give the requisite clamping effect. The relative displacement of the sleeves is effected by means of the mechanism illustrated in FIGS. 5 to 9, the construction and operation of the mechanism being described in detail hereinafter.

The displacement member **34** comprises a blade **34***a* which extends longitudinally of the machine, the said blade being supported by a plurality of spaced pusher rods **34***b* each mounted in a respective guide tube **34***c* for motion in the axial direction thereof and rods being driven from a common pusher rod shaft **36** via links **37** coupled to rocker arms **38** secured to the said shaft.

The oscillatory motion of the pusher rod shaft **36** is derived from the machine main shaft **39**, see FIGS. 4 and 5, via a connecting rod **40** mounted eccentrically on said shaft **39** and a linkage arrangement **41**, the said linkage arrangement being so constructed as to allow of an adjustment in the stroke of the pusher rods **34***b* and in the forward and/or rearward extreme position thereof. The linkage arrangement **41** comprises a stroke adjustment crank arm **41***a* pivotally connected to the upper end of the connecting rod **40** the crank arm **41***a* itself being pivotally supported by appropriate bearing means **41***b* on a fixed machine frame part **42**, a position adjustment crank arm **41***c* firmly secured to the shaft **36** by a taper pin **3**, and a connecting link **41***d* coupling the crank arm **41***a*, **41***c*. The crank arms **41***a*, **41***c* are each provided with an arcuate slot **41***a'*, **41***c'* respectively to receive a respective pivot pin **41***a''*, **41***c''* and an adjustment screw **41***e* is provided in respect of each such pin thus to allow of a variation in the position of the pin in its respective slot for adjustment purposes. A locking nut **41***f* is provided on each pin thus positively to maintain same in a selected position relative to the slot in which it is located. Vertical reciprocatory motion of the connecting rod **40** consequent upon continuous rotation of the main shaft **39** results in an oscillatory motion of the stroke adjustment crank arm **41***a* about the bearing means **41***b* therefor and such oscillatory motion, in turn, is transmitted to the position adjustment crank arm **41***c* by the connecting link **41***d*. An adjustment in the position of the pivot pin **41***a''* in its arcuate slot **41***a'* will result in an adjustment in the amplitude of the oscillation applied to the pusher rod shaft **36**, whilst an adjustment in the position of pivot pin **41***c''* in its slot **41***c'* will adjust the position of the stroke. The rear ends **34***b'* of each of the push rods **34***b* carry a common blade **34***d*, such blade **34***d* being engageable with the yarn **33** at the creel side of the machine and before such yarn reaches the first clamp **31**. The blade **34***d* extends between two spaced yarn guides **44**, and during reciprocation varies the yarn path between such guides. If, as is the case, the yarn clamp **31** is closed during retraction of blade **34***a*, outward motion of blade **34***d* will draw yarn from thec reel, not shown, and thus on the next forward stroke of blade **34***a* untensioned yarn can be drawn into the space between clamps **31**, **32** and thus no undue loading is applied to the pattern mechanism **35** or to the various other parts of the feed mechanism.

The mechanism **45** for operating the yarn clamps **31**, **32** is shown in FIGS. 69 to 9 and will be seen to comprise a cam **45***a* which is continuously rotated in timed relationship to the machine operation via a drive belt **45***b* and which co-operates with two cam followers **45***c* to pivot a bell crank lever **45***d* to actuate one or other clamp. The arrangement is best illustrated in FIG. 7 and consists of a casing **45***e* which is fixed in position upon the machine framework and within which the cam **45***a* is rotatably mounted, and a cam follower housing **45***f* arranged at each side of the casing **45***e* and movable relative thereto, the said housings being joined and movable as one and each having its respective cam follower rotatably supported therein. A lug **45***g* extends from one end of the right hand housing (as seen in FIG. 7) and

the upper end of the bell crank lever **45***d*, which lever is of inverted T-shape, is freely connected thereto. The bell crank lever is itself mounted upon the machine framework for pivotal motion about a fixed shaft **45***h* and the opposite ends of the horizontally disposed limb of such lever are each connected to the respective inner sleeve of the yarn clamps **31**, **32**. The cam **45***a* is continuously rotated and thus the bell crank lever is caused to oscillate back and forth about the shaft **45***h*. Oscillation of the lever **45***d* results in the alternate alignment or non-alignment of the respective inner and outer sleeves of the clamps **31**, **32** and thus the repeated and alternate actuation and non-actuation of such clamps.

The pattern mechanism **35** consists of a plurality of displaceable yarn guides **35***a* each individually controllable as to position by any appropriate means. Thus, for example, the said guides may be carried by the piston of pneumatic piston and cylinder arrangements contained within the block **35***c* air being applied to the individual arrangements or not thus to control the position of the pistons according to pattern requirements.

The operation of the feed device illustrated in FIGS. 2 to 9 of the accompanying drawings is similar to that of the arrangements shown in FIGS. 1 and 2 and no further description is thought necessary.

Whilst generally it will be preferred to provide a pattern mechanism **35** in the yarn feed device, this is by no means essential since such a mechanism will only be necessary if a variation in pile height in the finished product is required.

In the event that the pattern mechanism is not required, then a fixed yarn guide such as guide **46** (FIG. 10) would be provided instead of pattern mechanism **35**.

What we claim is:

1. Yarn feeding apparatus comprising spaced stop means between which the yarn extends and through which the yarn passes, and a displacement means located intermediate the said stop means and engageable with yarn passing therebetween, the stop means furthest in the direction of feed of the yarn being actuable to clamp yarn passing therethrough during advancing movement of the displacement means while the other stop means remains open, the condition of the respective stop means being adapted to be interchanged during part at least of the reversing movement of the said displacement means, said displacement means including a member adapted to engage the yarn and to effect a transverse displacement thereof, said yarn stop means being arranged one at each side of the said member and adapted respectively to act on the yarn at each such side, and a pattern control mechanism adapted to act on the yarn between the said member and one of the stop means, the said stop means being operable alternately so as to allow of the withdrawal of yarn from a supply source by the said member during a part of the machine cycle while simultaneously preventing withdrawal of yarn from the area between the stop means during the same period and to allow of the withdrawal of yarn from the area between the said stop means during another part of the machine cycle while simultaneously preventing withdrawal from the supply source, the said pattern control mechanism being adapted for a constant amplitude of movement of the feed device to vary the maximum path length between the stop means independently of such feed device.

2. A method of feeding yarn from a source of supply through spaced stop means comprising feeding a yarn between and through said stop means, alternately opening each of said stop means while the other is closed, initiating a transverse displacement of said yarn between said stop means for feeding a length of yarn from said source of supply while said stop means downstream of said displacement is closed, selectively initiating a further variable transverse displacement of yarn between said stop means in accordance with a prescribed pattern while said stop means downstream of said displacement is closed, and feeding the displaced yarn from between said stop means while said stop means upstream of said displacement is closed.

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ALLEN N. KNOWLES, Primary Examiner

U.S. Cl. X.R.

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