United States Patent [19]

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[11] **3,859,936**

[45] **Jan. 14, 1975**

[54] **FABRIC FEEDING DEVICE FOR SEWING MACHINES**

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[22] Filed: **Jan. 25, 1974**

[21] Appl. No.: **436,782**

Related U.S. Application Data

[63] Continuation of Ser. No. 142,938, May 13, 1971, abandoned.

[30] **Foreign Application Priority Data**

May 15, 1970 Italy 42907/70

[52] **U.S. Cl.** **112/76,** 92/2

[51] **Int. Cl.** **D05b 3/04**

[58] **Field of Search** 112/76, 77, 70, 65; 92/2; 91/173

[56] **References Cited**

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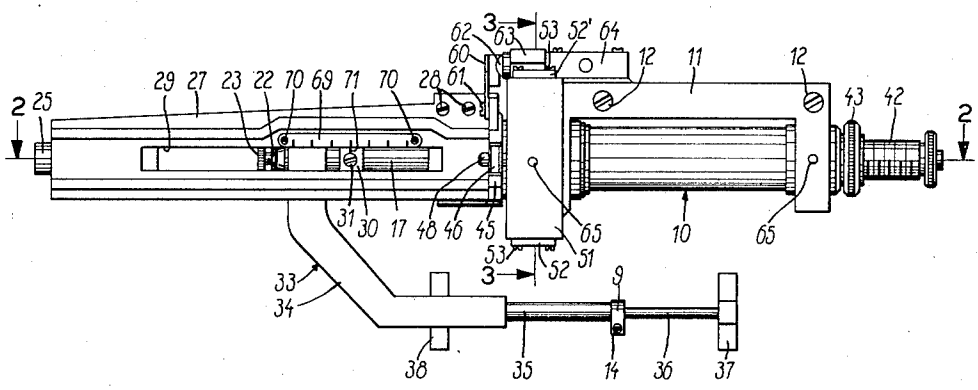
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[57] **ABSTRACT**

The invention relates to a fabric feeding device for sewing machines which must travel along a rectangular path in order to grip and advance a fabric past the sewing needle and then release the fabric and return to a starting position. A pneumatic drive cylinder is employed to drive a fabric clamp, said cylinder being rotatable about its own axis in order to effect the respective movements of the clamp towards and away from the fabric.

4 Claims, 4 Drawing Figures



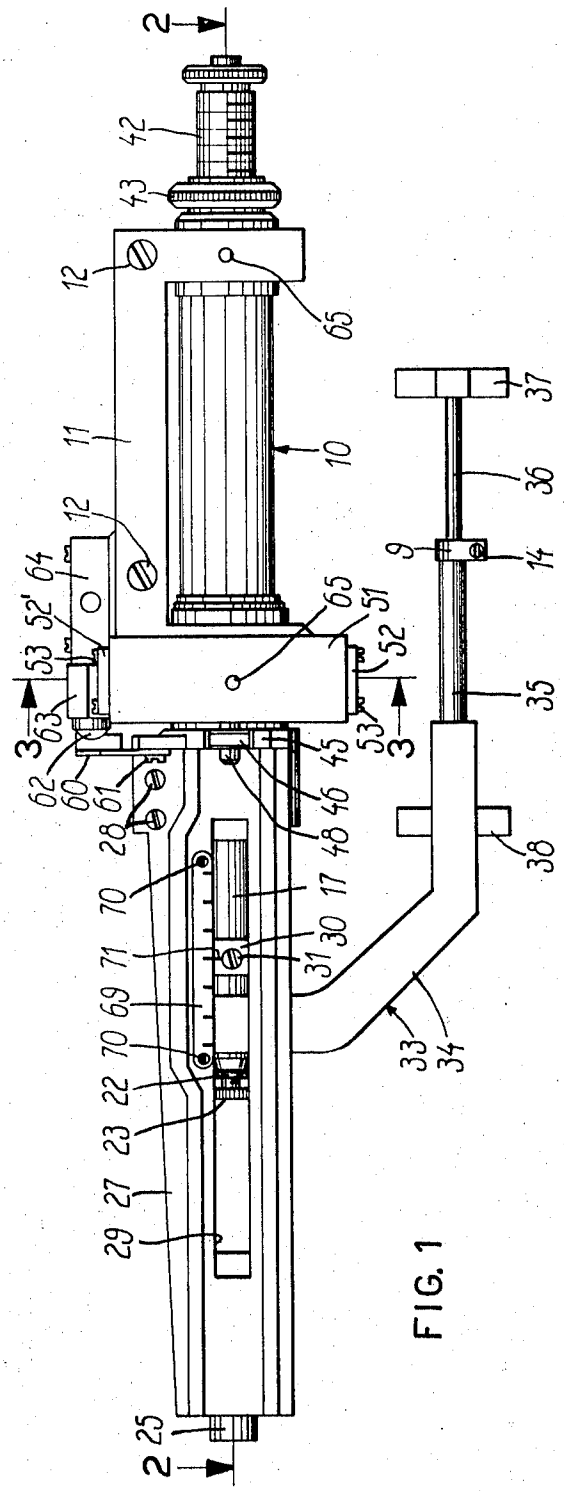


FIG. 1

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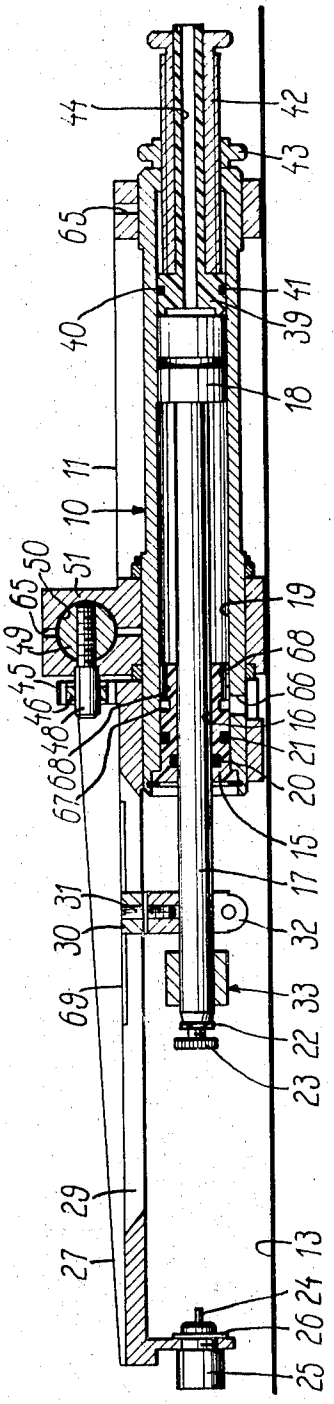

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FIG. 2

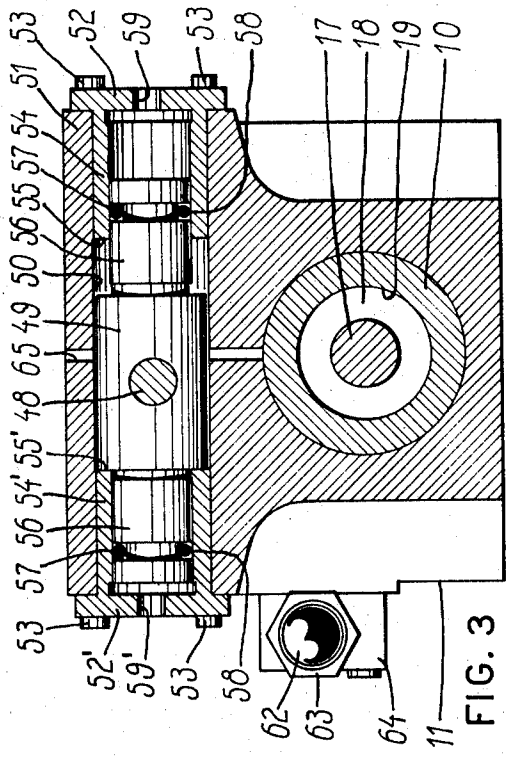
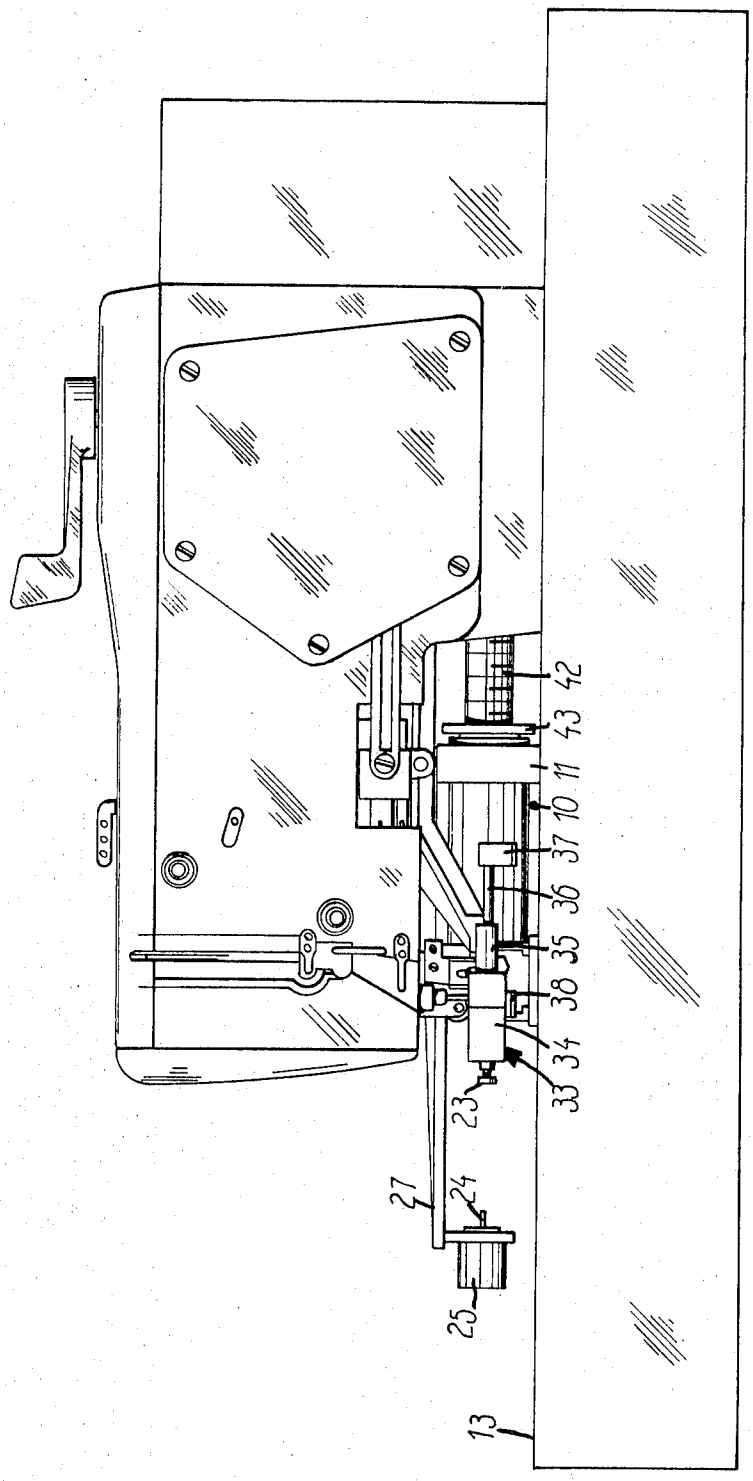

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FIG. 3

FIG. 4



FABRIC FEEDING DEVICE FOR SEWING MACHINES

This a continuation of application Ser. No. 142,938, filed May 13, 1971 and now abandoned.

The present invention refers to a fluid operated fabric feeding device applied to sewing machines which effect groups of stitches, and particularly to button or button-hole sewing machines, which are adapted to execute successive sewing operations at a pre-arranged distance apart from each other.

Already known in the art are devices which are operated pneumatically and are suitable for automatic feeding of the fabric past the sewing needle. Such known machines are provided with an arm which moves along a rectangular path which arm is driven by pneumatic motors. The translations of the arm along one pair of the parallel sides of the rectangle are used for moving the arm transversely relative to the fabric, while the translations along the other pair of parallel sides of the rectangle are used to feed the fabric, and to carry the arm back to its start position, ready to begin another feeding phase. Said types of known devices are remarkably complex, need excessive space and are costly.

An object of the present invention is to provide a new type of simple working device, not very bulky and having a rather low cost.

According to the present invention, the resolution of the technical problem is realized by means of a driving cylinder whose piston rod is rigidly connected to an arm, means being provided to cause said cylinder to oscillate rotatively together with its piston rod, the rod only reciprocating axially in alternating sequence to the cylinder oscillations so that said arm is caused to follow a rectangular path.

The features and advantages mentioned above and not restrictive of the invention will be apparent from the following description and from the attached drawings in which:

FIG. 1 is a plan view of the device according to the invention;

FIG. 2 is a cutaway view of the device of FIG. 1 taken along line 2—2;

FIG. 3 is a cutaway view of the device of FIG. 1 taken along line 3—3 and

FIG. 4 is a side elevational view of the fabric feeding device attached to a sewing machine.

Drive cylinder **10** is rotatively supported within C-shaped support member **11** which in turn is fixed to the not shown bed of the machine by screws **12.** Cylinder **10** defines a piston chamber **19** within which piston **18** reciprocates together with its rod **17** which extends outwardly of the cylinder through a bore **16** in fixed seal element **15.** Seal rings **20** and **21** serve to prevent air leakage past the rod and past the seal element into chamber **19.**

At the other end of piston rod **17,** a screw **23** is locked by means of nut **22,** which at the end of the stroke of said piston rod **17,** acts against rod **24** of a three-way valve **25** which is fixed, to a mounting member **27,** by means of a nut **26.** Said member **27** is fastened to drive cylinder **10** by means of screws **28,** as shown in FIG. **1.** Said member **27** has a central guide **29** along which a square block **30** slides and is connected to a tie member **32** by means of a pin screw **31,** said tie member **32** being fastened to piston rod **17.**

An arm **33** (FIG. **1**), integral with said piston rod **17,** comprises a part **34** fastened at one end to said piston rod **17,** by means of a tie not shown in the drawings, and carries, pivoted at the other end a rod **35,** a shaft **36** being fixed thereto by means of tie **9** and screw **14** and carrying at its free end a pad **37.** A second pad **38** is connected directly to rod **35** at a suitable distance from the first pad. The distance between the two pads **37** and **38** can be changed within certain limits, by loosening screw **14** and causing shaft **36** to slide into hollow rod **35.** Said pads **37** and **38** have the task of frictionally engaging the fabric and carrying and positioning an adjustable and pre-arranged amount of said fabric under the needle that will effect successive stitchings thereon.

At the other end, cylinder **10** is closed by a cylindrical body **39** having a circumferential groove **40,** in which a rubber gasket **41** is placed and an axial hole **44,** the function of which will be described hereinafter.

Cylindrical body **39** is rigidly fastened along the inner portion of a second cylindrical body **42** which is externally threaded along a smaller diameter portion thereof. Said cylindricaly body **42** can be adjusted axially to assume different positions relative to chamber **19.**

A ring nut **43** prevents said cylindrical body **42** from moving axially relative to any pre-arranged position, during operation of the device. In this way, the distance between successive button-holes will be kept uniform as will be described hereinafter.

Mounting member **27** has a fork **45** at its end which is fixed to cylinder **10.** Said fork **45** cooperates with a square element **46** connected to piston member **49** by means of a screw pin **48.** Said piston member **49** can slide within a cylindrical cavity **50** (FIG. **3**) in the body **51** of C-shaped member **11.** Said cavity **50** is closed at its ends by means of covers **52** and **52'** fixed to body **51** by means of screws **53.**

Said covers **52** and **52'** comprise annular extensions **54** and **54'** respectively which extend axially into the cylindrical cavity **50** thus delimiting by their ends **55** and **55'** the stroke of piston member **49.** Said piston member **49** comprises axially opposed cylindrical prolongations **56** slidable within extensions **54** and **54'** said cylindrical prolongations **56** having smaller diameter than the central portion of **49** and being provided with a circumferential groove **57** in which a rubber gasket ring **58** is fitted. Covers **52** and **52'** are provided with holes **59** and **59',** respectively, suitable to put the respective cylindrical cavities in communication with a compressed air source provided by the pneumatic system driving the device.

When piston **49** slides within cavity **50,** it drags along the screw pin **48** and the square element **46** connected thereto, as described hereinabove.

The displacement of said square element **46** in fork **45** causes the rotation of mounting member **27** fixed thereto, and therefore the rotation of cylinder **10** fixed to said member **27,** about the axis of the cylinder itself. During such rotation, a plate **60** fixed to mounting member **27** by means of screw **61** (FIG. **1**), acts against a ball member **62** of pilot member **63** of a four way valve **64** whose function will be described hereinafter.

Holes **65** are provided in C-shaped member **11** to allow lubrication of the parts of cylinder **10** which are rotatably supported in mounting member **11.**

The fabric feeding movements are imparted to arm **33** by the oscillatory rotations and the axial displacements of piston rod **17** which occur in alternate succession, as described hereinafter.

At the beginning of a feeding cycle piston member **49** is in the position shown in FIG. **3**. Then compressed air supplied by the suitable system through hole **59'** enters cylindrical cavity **50** and displaces piston **48** towards the opposite hole **59**. For the reasons mentioned above, such movement causes the rotation of mounting member **27** and rotation of cylinder **10** and piston rod **17** with the consequent lowering of pads **37** and **38** onto the fabric piece to be fed. At this point, compressed air passes through axial hole **44** and into chamber **19** of cylinder **10** and displaces piston **18** toward seal element **15**. Fabric is thereby dragged by the two pads **37** and **38** which move integrally with piston rod **17** of piston **18**. At the end of this stroke of piston **18**, member **23** at the end of piston rod **17** switches the valve **25** which causes air to flow into cylindrical cavity **50** of body **51** through hole **59**.

Piston **49** therefore displaces towards hole **59'** and such displacement causes an axial rotation of piston rod **17** and of cylinder **10** opposite to that described previously, and the consequent lifting of pads **37** and **38** away from the fabric.

After lifting of the pads **37** and **38**, compressed air passes through hole **66** (FIG. **2**) in cylinder wall **10**, a circumferential groove **67** in seal element **15**, and holes **68** parallel to the axis of said element **15**, and enters chamber **19** thereby displacing piston **18** towards hole **44** causing piston **18** and piston rod **17** to return to the position of FIG. **2** corresponding to the beginning of a new phase of fabric feeding.

In order to obtain a variation in the length of the feeding stroke, it is necessary to loosen ring nut **43**, to screw or unscrew cylindrical body **42** causing the variation of the length of chamber **19**, and to then tighten said ring nut **43** in the new position.

By decreasing the length of chamber **19**, a decrease in the distance between two consecutive buttonholes, is obtained while by increasing said length, an increase in the distance between two consecutive buttonholes is obtained.

When index **71**, at the beginning of a feeding phase, is in the extreme right notch of the graduated scale; cylindrical body **42** delimiting the stroke of piston **18** is in its extreme right position and in this case the greatest displacement of the fabric is obtained and therefore the greatest distance between two consecutive buttonholes. There is the smallest displacement of the fabric and therefore the smallest distance between two consecutive buttonholes when index **71** is on the extreme opposite notch at the left of the graduated scale. In this case cylindrical body **42** is threaded completely into cylinder **10**.

In FIG. **1**, index **71** is in the intermediate notch of the graduated scale and the distance between two consecutive buttonholes has in this case an intermediate value between the greatest and smallest obtainable.

What is claimed is:

1. A sewing maching having a fabric feeding device comprising: a fabric gripping means and a drive means for driving said gripping means along a rectangular path, said drive means comprising a fluid actuated first cylinder having a first piston therein and a piston rod rigid with said first piston and rigidly attached to said gripping means, whereby reciprocations of said first piston are transmitted to said gripping means in correspondence to two of the parallel sides of said rectangular path, a second cylinder and piston therein, a multiway valve means for directing a pressurized fluid respectively into opposite ends of said second cylinder so as to drive the second piston alternately in opposite directions, said second piston being drivingly connected to the first mentioned cylinder so as to oscillatingly rotate said first mentioned cylinder and piston about their own axis pursuant to reciprocations of said second piston to drive said gripping means along the other two parallel sides of said path.

2. The machine of claim **1**, wherein the reciprocations of said first piston correspond to reciprocations of said gripping means along the direction of fabric travel while the oscillatory rotations of said cylinder correspond to opposed movements of said gripping means transversely to the direction of fabric travel.

3. The machine of claim **1**, wherein said valve means are actuated by the first mentioned piston rod.

4. The machine of claim **2**, including a means to vary the length of stroke of said piston whereby the fabric feeding stroke of said gripping means is varied.

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