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71 Applicant: **ELEMACS.p.A.**
Via Trento, 54
I-27023 Cassolnovo Pavia(IT)

72 Inventor: **Bocca, Giuseppe**
C.so Pavia 18
Vigevano (Pavia)(IT)

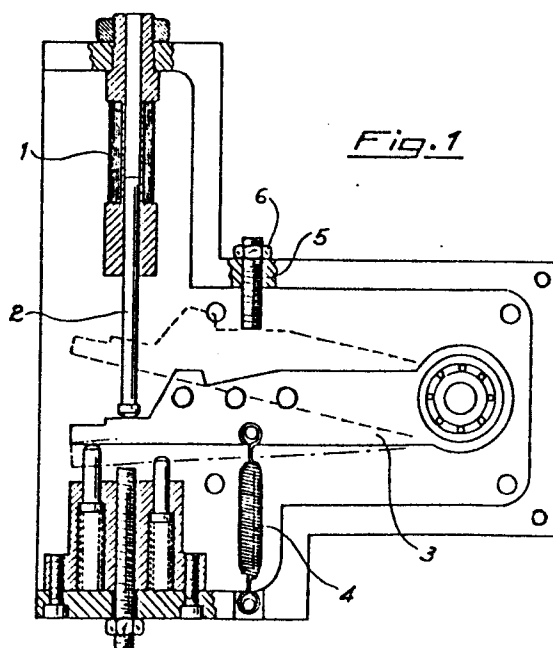
74 Representative: **Lecce, Giovanni**
Ufficio Internazionale Calciati S.r.l. Via G. Negri 10
I-20123 Milano(IT)

54 **Control apparatus of speed, position and specific functions for industrial sewing machines.**

57 Control apparatus of speed, position and specific functions for industrial sewing machines through a digital technique with a varying inductance input, comprising a spool (1) intersected by a shaft (2) activated by a lever (3) connected to the machine treadle.

The different positions that the shaft (2) moves to in the spool (1) determine just as many differentiated inductance outputs.

Said inductance outputs are transmitted to the machine electrovalves dedicated to the various service operations.



1.

"Control apparatus of speed, position and specific functions for industrial sewing machines".

The present invention relates to control apparatus of speed, position and specific functions for industrial sewing machines.

To be more precise, the present invention refers to control apparatus of speed, position and special functions for industrial sewing machines, realized with a digital technique having an input with variable inductance.

Functions control apparatus for industrial sewing machines are already known ; however, in the former, the input (i.e. the transduction of the controlled pressure exerted by the operator on the machine treadle) is determined by means of disks or rotating photographic cams.

The various tracks incised on the photographic cams, acting as so many optic switches, transmit the various signals to the machine for the speed, position of the needle, pressure foot, threadcutter, etc.

Other apparatus achieves the same effect not through an optical effect, but by means of simple contacts, others adopt potentiometers. In all these cases working setbacks occur quite frequently, caused by wear of the contacts, exposure to dust, as well as a limited mechanical endurance of the parts.

Moreover, in these instruments the brake-clutch unit, which is the principal organ, is controlled with the same technique according to the characteristics of each embodiment, for which a tiresome adjustment and line-up of
5 several parts is required.

Another drawback found in the known apparatus is that the type of synchronizers found in them, comprising disks or optic switches, or other contact systems, cannot be interchanged, that is to say, they may not be adopted in-
10 discriminately for sewing machines, the characteristics of which differ from one to the other : consequently, it is necessary that each type and/or make of machine be matched with specific cams or contact systems. Finally, the initial line-up in the known instruments involves a great deal of time and does not reach the necessary, lasting precision and the control of maximum speed.

The present invention solves the above-mentioned problems and drawbacks by conducting a control on speed, position and specific functions in industrial sewing machines, through a digital technique with an input having
20 variable inductance.

The control apparatus of the present invention mainly consists of a spool intersected by a shaft, activated by a lever connected to the sewing machine treadle by means
25 of a system of rods and levers.

The various positions that the shaft or rod, sliding in the spool and activated by the lever, moves to, as a result of the controlled pressure exerted by the operator on the treadle, determine the same number of outputs with differentiated inductance. Said inductance outputs are transmitted to the electrovalves, dedicated to various service operations, such as stopping of the machine, activation of a threadcutter or the pressure treadle, reverse gear or positioning of the needle, etc.

through :

- an electronic computer with numerical display, for the processing of impulses deriving from the spool itself;
- a technical panel and synchronizer forming an integral part of the main camshaft of the sewing machine;
- and an electrovalve power actuator.

The power actuator sets into motion the various electrovalves dedicated to the various working stages.

The advantages obtained from the present invention consist mainly in the fact that since the input does not

necessitate specific optic or contact switches and employs only differentiated impulses or signals generated from the linear variation of inductance of a spool intersected by a rod, it gives a high electrical reliability due to an almost total absence of mechanical wear.

Moreover, the synchronizer, being provided with a single

standard disk, may be applied to a great number of sewing machine types or makes, even with construction characteristics different one from the other and permits, moreover, thanks to the digital technique adopted herein, 5 extremely accurate and lasting controls and adjustments.

The present invention will be better understood from the following detailed description in which reference is made to the appended drawings which show a preferred embodiment, illustrative but not limitative of the control e- 10 quipment of the present invention, wherein :

figure 1 shows a perspective schematic view of the driving device of the spool shaft; and

figure 2 shows the connection diagram of the parts comprising the control equipment of the present invention.

15 With reference to figure 2, the control apparatus of speed, position and specific functions for sewing machines realized using a digital technique, with variable induction input comprises an input having variable induction 7, a computer 8 with display 9, a technical panel 10, operator panel 11, an electrovalve power actuator 12, a brake-clutch group regulator 14 placed upstream of the brake-clutch group 13 and the motor 15, and a synchronizer 16.

As shown in figure 1, and according to the present invention, 25 the input with variable inductance 7 comprises

a spool 1 intersected by a shaft 2; a lever 3, activated by a machine treadle, and which moves said shaft 2 inside the spool 1; a return spring 4 which keeps the lever 3 in the lower downstroke position and an adjustable screw 5 which sets the stroke of the lever 3.

The screw 5 is blocked by a lock nut 6. In accordance with the present invention, the position and speed transducer unit, comprising a spool 1 containing a sliding rod 2, is housed in a casing made of sheet steel or cast aluminium or other material suitable for the purpose. The lever 3 is activated by the treadle through a system of rods not shown in the figure. The varying controlled pressure exerted by the operator on the treadle, forming part of the unit 7 comprises an angular shifting of the lever 3 which then acts on the shaft 2 sliding in the spool 1, causing variations in continuous inductance inside the same, corresponding to each position that the shaft 2 moves into.

The spool 1, linked to a computer 8, preferably placed near a working table but in such a manner as not to impede sewing operations, transmits to same the differentiated impulses, caused by the shaft 2 sliding in the spool 1. Said impulses, transduced in numeral entities, are assimilated by the computer 8 which, depending

on the inputs, establishes the appropriate signals to be sent to an electrovalve power actuator 12. Once the latter has received the various signals from the computer 8, it activates the separate electrovalves which control the various service operations, such as the treadle lifter, the reverse gear, return of the flywheel and the thread-cutter.

The display 9, placed so as to be under the operator's immediate control, permits a continuous check, in the form of numbers, on the sewing machine camshaft positions.

The initial setting of the technical panel 10 is carried out just once at the beginning and subsequently memorized by the computer. This operation is facilitated by appropriate symbols or reference points present on the same panel 10. This permits setting of the starting point for all subsequent adjustments, regardless of the type of machine being used. Use of the computer and digital technique make it possible to set one or more positions of the machine camshaft and memorization of same ; moreover, it is used to drive the brake-position group by means of a regulator 14 and sets accurately the maximum machine speed, which consequently cannot be exceeded.

During sewing operations, it may be necessary to stop the needle or the treadle in the high or low position

for both at the same time, or first for one and then the other, together with other operations such as cutting the thread ; all these operations, previously scheduled and memorized by the computer 8, may be recalled, whenever
5 necessary, according to an infinity of combinations, through the operator panel 11, equipped with a keyboard bearing symbols and connected to the computer 8.

CLAIMS

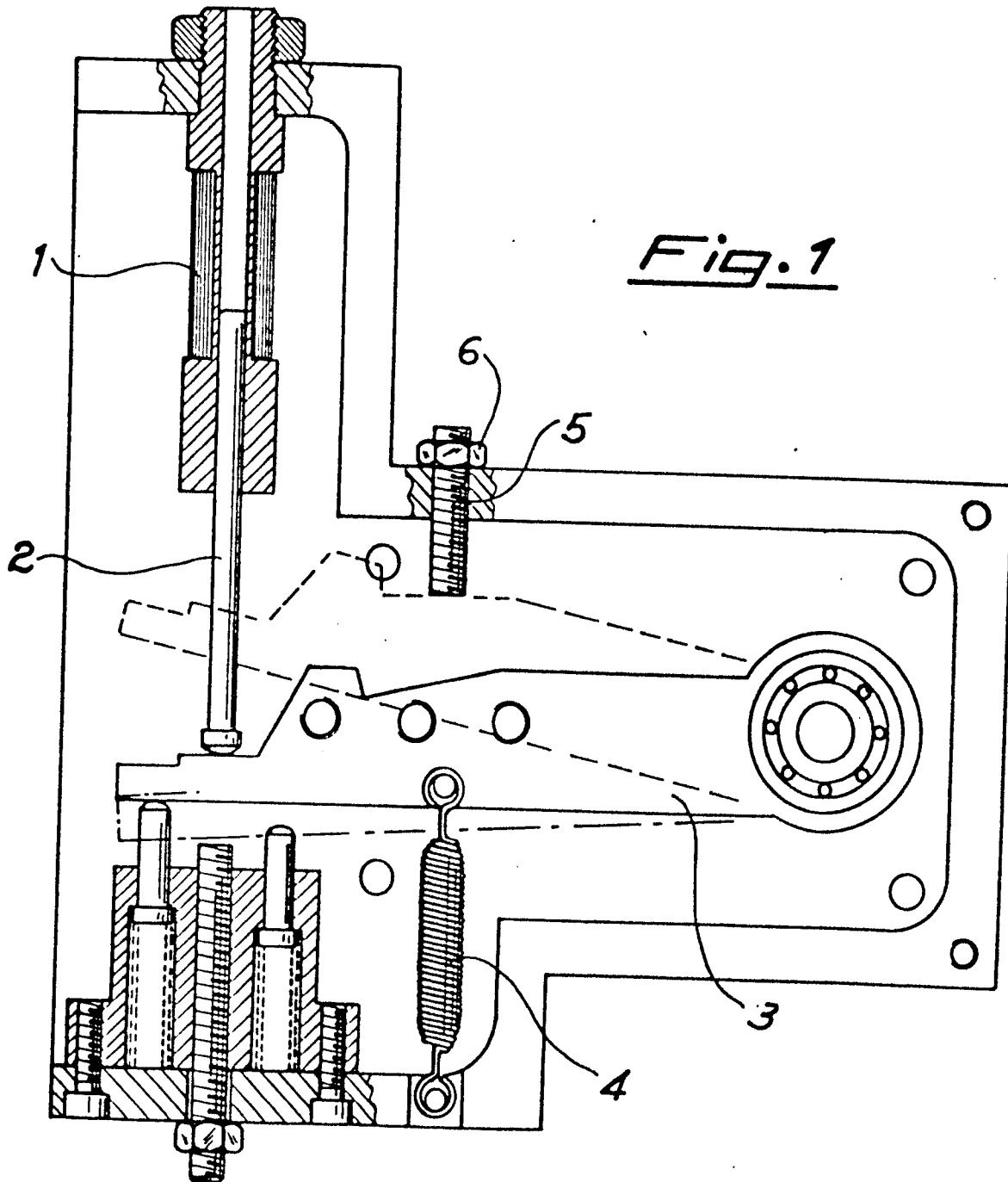
1. Control apparatus of speed, position and special functions for industrial sewing machines, using a digital technique, characterized by the fact that it employs a variable inductance input and comprises a spool intersected by a shaft, run by a lever connected to the machine treadle.
2. Apparatus according to claim 1, characterized by the fact that the inductance, corresponding to each position of the shaft in the spool, is transmitted to the electrovalves, dedicated to the various working operations, by means of an electronic computer with numeric display, a technical panel and a synchronizer, forming an integral part of the main camshaft of the sewing machine, and an electrovalve power actuator.
3. Apparatus according to claim 2, characterized by the fact that the computer numeric setters are able to memorize one or more positions of the machine camshaft.
4. Apparatus according to previous claims 2 or 3, characterized by the fact that the display permits continuous viewing, in the form of numbers, of the sewing machine camshaft position.
5. Apparatus according to the previous claims 2 to 4, characterized by the fact that the running of the brake-clutch unit is actuated by means of a digital technique.

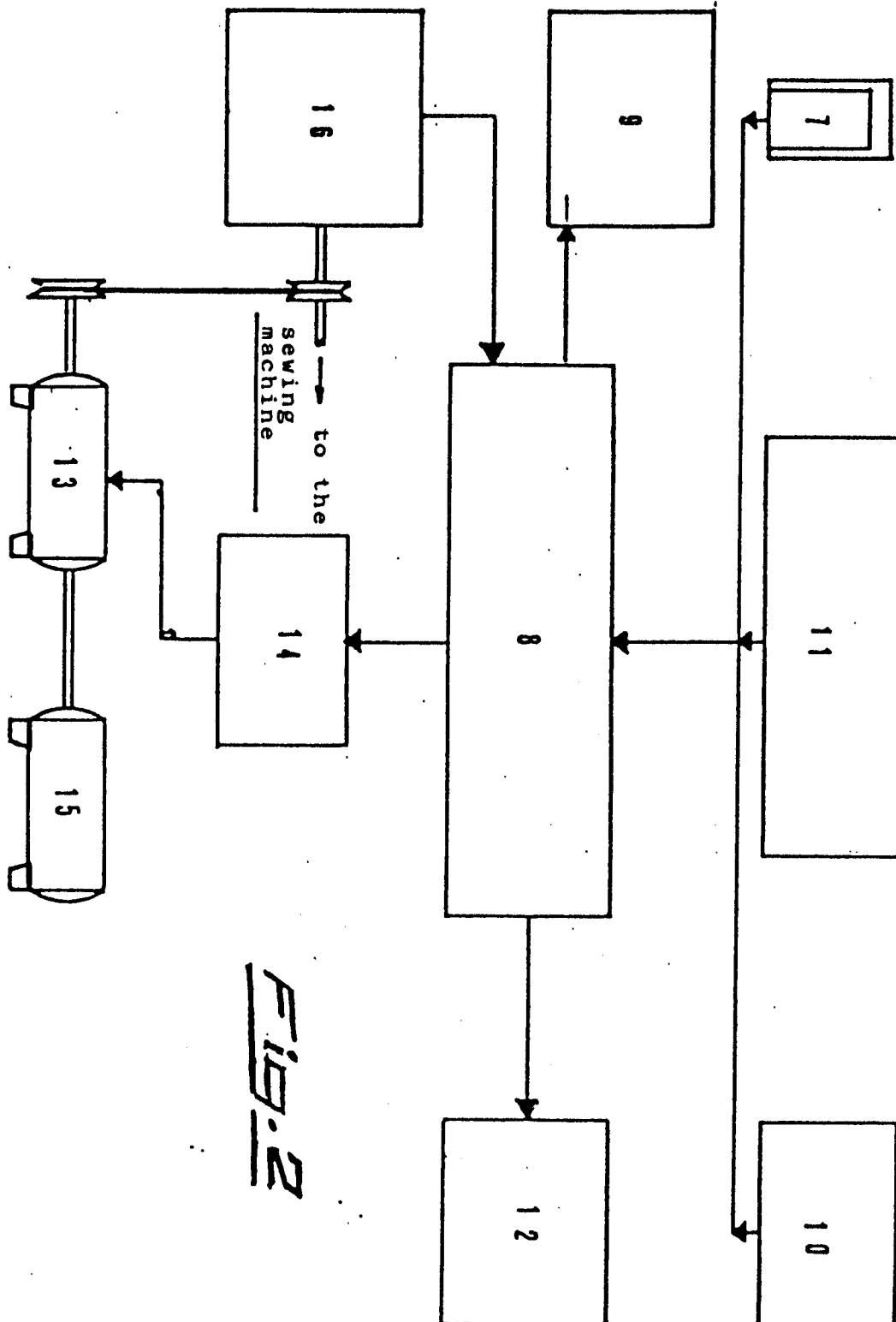
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6. Apparatus according to the previous claims 2 to 5, characterized by the fact that setting of the maximum speed which may be reached by the sewing machine is carried out electronically.

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Fig. 2