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

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Description

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 several parts is required.

Another drawback of the known apparatuses 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 indiscriminately 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. A control apparatus for sewing machine according to the preamble of claim 1 is known from US-A 4,517,909.

The control apparatus disclosed in the reference operates by the variation of a magnetic field.

Furthermore, WO-84 02933 discloses an electronic controlling equipment for driving systems, with electromagnetic coupling for industrial sewing and/or overcasting machines, using a variable inductance input. The variable inductance input is generated by a control device comprising a ferromagnetic shaft driven by the operator and performing the inductive coupling between two coils:

the primary coil supplied by a rectangular voltage generator and the secondary coil whose supply depends on the inductive coupling between the two coils by the ferromagnetic shaft. In the control device of this reference the variable inductance input is the voltage amplitude which cannot be directly applied to a digital circuit, but needs first to be transformed into a digit or numerical binary entity by an electronic circuit.

The object of the present invention is to provide a control apparatus of speed, position and special functions for industrial sewing machines using a digital technique, which does not exhibit the above mentioned problems and drawbacks.

According to the present invention, the above subject is achieved by a control apparatus of speed, position and special functions for industrial sewing machines by using a digital technique, said control apparatus comprising a variable inductance input generated by a coil intersected by a core driven by a lever connected to the sewing machine treadle. The connection between the lever and the sewing machine treadle is obtained by a system of rods and levers.

The various positions that the core or rod, sliding in the coil and driven 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 coil 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, extremely accu-

rate 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 equipment of the present invention, wherein :

figure 1 shows a perspective schematic view of the driving device of the coil core and

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

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, the input with variable inductance 7 comprises a coil 1 intersected by a core 2; a lever 3, driven by a machine treadle, and which moves said shaft 2 inside the coil 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 coil 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 driven 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 core 2 sliding in the coil 1, causing variations in continuous inductance inside the same, corresponding to each position that the core 2 moves into.

The coil 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 core 2 sliding in the coil 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 threadcutter.

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 necessary, according to an infinity of combinations, through the operator panel 11, equipped with a keyboard bearing symbols and connected to the computer 8.

30 Claims

1. A control apparatus of speed, position and special functions for industrial sewing machines using a digital technique, characterized in that said control apparatus comprises a variable inductance input generated by one coil (1) intersected by a core (2) driven by a lever (3) connected to the sewing machine treadle.
2. A control apparatus of speed, position and special functions for industrial sewing machines according to claim 1, characterized in that it comprises:
 - a computer (8) connected to the coil (1) of the transducer, receiving the differentiated impulses generated by the core (2) sliding into the coil (1) and generating therefrom numeral signals;
 - an electrovalve power actuator (12) receiving the various signals generated from the computer (8) and activating the separate electrovalves which control the various service operations; and
 - a clutch - brake group (13) for controlling the maximum speed of the sewing machine associated with said numeral signals.

3. A control apparatus of speed, position and special functions for industrial sewing machine, according to claim 2, characterized in that it further comprises:

- an operator panel (11) connected to the computer (8), and
- a technical panel (10) connected to the computer (8) and setting the starting point and the positions of the core (2).

Revendications

1. Un dispositif de commande de vitesse, de position et de fonctions spéciales pour des machines à coudre industrielles utilisant une technique numérique, caractérisé par le fait que ce dispositif de commande comprend une entrée d'inductance variable créée par une bobine (1) intersectée par une âme (2) dirigée par un levier (3) connecté à la pédale de la machine à coudre.

2. Un dispositif de commande de vitesse, de position et de fonctions spéciales pour des machines à coudre industrielles d'après la revendication 1, caractérisé par le fait qu'il comprend:

- un ordinateur (8) connecté à la bobine (1) du capteur, recevant les impulsions différenciées créées par l'âme (2) glissant dans la bobine (1) et créant donc des signaux numériques;
- un actionneur de puissance à soupape électrique (12) recevant les différents signaux créés par l'ordinateur (8) et actionnant les soupapes électriques séparées qui commandent les différentes opérations de service; et
- un groupe frein-embayage (13) pour la commande de la vitesse maximale de la machine à coudre associé aux susdits signaux numériques.

3. Un dispositif de commande de vitesse, de position et de fonctions spéciales pour machines à coudre industrielles, d'après la revendication 2, caractérisé par le fait qu'il comprend en outre:

- un panneau d'opérateur (11) connecté à l'ordinateur (8), et
- un panneau technique (10) connecté à l'ordinateur (8) et qui met le point de départ et les positions de l'âme (2).

Patentansprüche

1. Ein Gerät zur Regelung der Geschwindigkeit, Position und besonderen Funktionen für Indu-

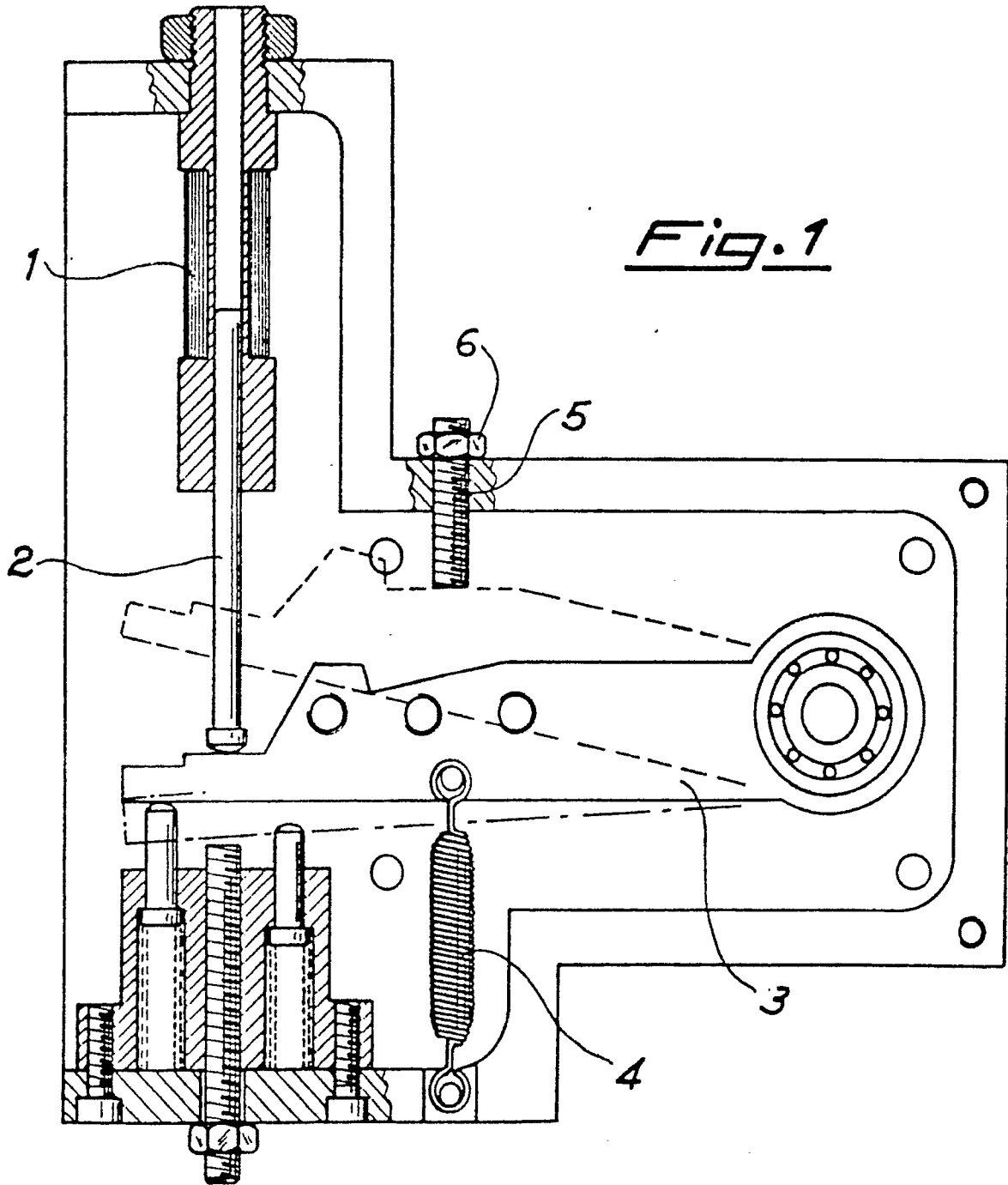
strienähmaschinen, bei dem eine Digitaltechnik benutzt wird, gekennzeichnet dadurch, daß dieses Steuergerät aus einem variablen Induktivitätsinput besteht, das von einer Spule 1) erzeugt, durch einen Kern (2) geschnitten und durch einen Hebel (3), der mit dem Pedal der Nähmaschine verbunden ist, gesteuert wird.

2. Ein Gerät zur Regelung der Geschwindigkeit, Position und besonderen Funktionen für Industrienähmaschinen gemäß Patentanspruch 1, gekennzeichnet dadurch, daß es aus folgendem besteht:

- einem Computer (8), der mit der Spule (1) des Transduktors verbunden ist, wobei er die verschiedenen, vom Kern (2) erzeugten Impulse empfängt und in die Spule (1) gleiten läßt und so numerische Signale erzeugt;
- einem Elektroventilleistungstrieb (12), der die verschiedenen von dem Computer (8) erzeugten Signale empfängt und die getrennten Elektroventile betätigt, die die verschiedenen Betriebsvorgänge steuern; und
- einer Kupplung - Bremssatz (13) zur Regelung der Höchstgeschwindigkeit der Nähmaschine, verbunden mit diesen numerischen Signalen.

3. Ein Gerät zur Regelung der Geschwindigkeit, Position und besonderen Funktionen für Industrienähmaschinen, gemäß Patentanspruch 2, gekennzeichnet dadurch, daß es außerdem aus folgendem besteht:

- einer mit dem Computer (8) verbundenen Operatorkonsole (11) und einer technischen Tafel (10), die mit dem Computer (8) verbunden ist und den Ausgangspunkt sowie die Positionen des Kerns (2) einstellt.



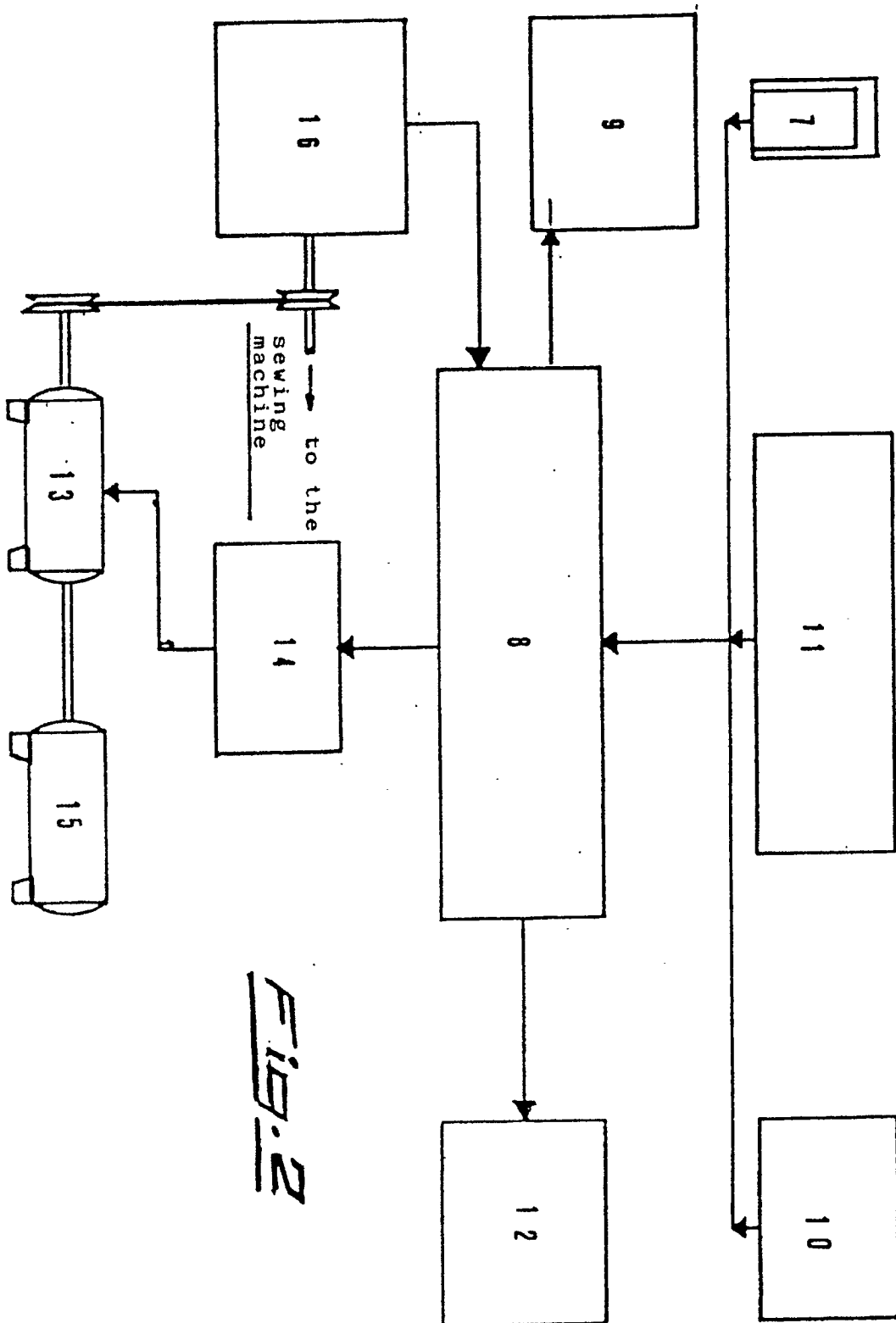


Fig. 2