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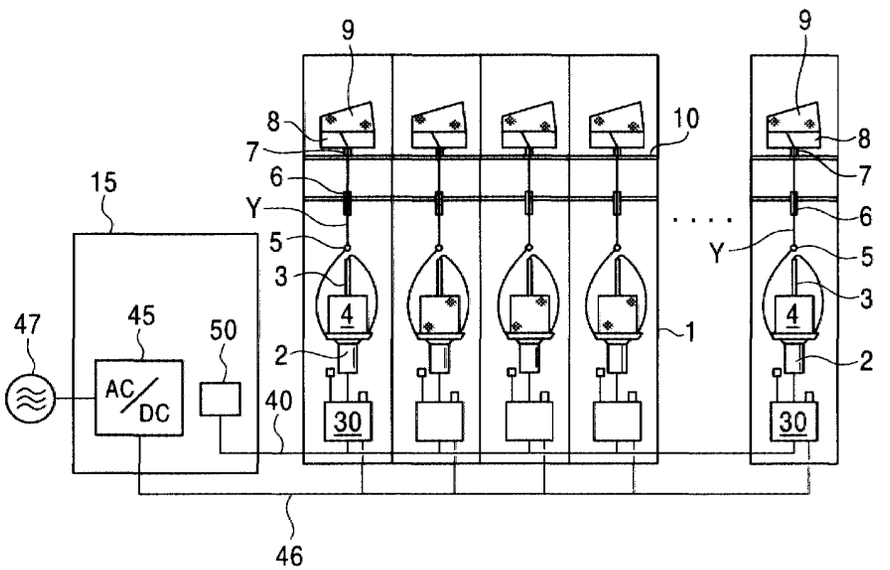
(54) Motor-driving system for an individual-spindle-drive type textile machine

(57) It is an object to provide a motor driving system for an individual-spindle-drive type textile machine which is to reduce the number and the cost of wiring for a plurality of spindle units by reducing a number of transmission lines to transmit respective command signals. A motor driving system for an individual-spindle-drive type textile machine is provided with a plurality of drivers 30 individually controlling drive motors 2 in each spindle unit and a signal setting device 50 connected to a plurality of drivers 30 via a common command signal transmission line 40. The signal setting machine 50 is provided with means of forming rotational speed command signals represented as a frequency according to an intended rotational speed of respective drive motors 2 and parameter command signals indicating parameter to set an operational condition to transmit each command signal via the common command signal transmission line 40 to each driver 30 distinguishing between rotational speed command signals and parameter received from the signal setting device 50 to control each drive motors 2 in accordance with the recognition

FIG. 1



EP 1 178 137 A1

Description

Field of the Invention

[0001] The present invention relates to a motor-driving system which is concerned with an individual-spindle-drive type textile machine to control an individual drive motor in each unit.

Background of the Invention

[0002] An individual-spindle-drive type textile machine, e.g. an individual-spindle-drive type multi- twisting machine, which provides exclusive drive motor for each unit of the multi-spindle unit, is known so far. This twisting machine controls each drive motor individually by a plurality of motor drivers fitted in every unit or a plurality of units.

[0003] In the twisting machine like this configuration, it is required to have even rotational control over drive motors in respective units because a rotational speed on each driving motor affects the quality of twisted yarn from one unit to another. Therefore, in the twisting machine, a rotational speed command signal, which controls a rotational speed of each drive motor at an intended speed, is separated from a parameter command signal to set an operating condition and command signals to drive or stop each drive motor to transmit individually to each motor driver. This rotational speed command signal is transmitted from a signal setting device via a transmission line of the rotational speed to each driver. The parameter command signal is transmitted driver from the signal setting machine via a serial transmission line to each motor, and the "DRIVE" or "STOP" signals are also transmitted driver from the signal setting device via a drive transmission line to each motor.

[0004] Then, these respective motor drivers accurately monitor the rotational speed of each drive motor while having an optimal control over the rotation of each drive motor according to respective command signals transmitted from the setting device via three transmission lines.

[0005] Each command signal transmitted from a signal setting device, as stated above, is transmitted via three transmission lines to each motor driver.

Thus, an individual-spindle-drive type multi-twisting machine which is composed of a plurality of units must have three transmission lines wired to cover a plurality of units, so that a high cost and man-hour of wiring are problems.

[0006] Accordingly, the object of the present invention is to provide a motor driving system for an individual-spindle-drive type textile machine which delivers a reduction in the cost and the man-hour of wiring for a plurality of spindle units by reducing the number of transmission lines to transmit each command signal to respective drivers.

Summary of the Invention

[0007] The motor drive system of the present invention, to achieve the object as mentioned above, the motor driving system for an individual spindle-drive-type textile machine provided with a plurality of drivers which individually control drive motors mounted in respective units and a setting device which is connected to a plurality of drivers via a common command signal transmission line, is comprised of said setting device providing a means for forming a rotational speed command signal of a frequency corresponding to an intended rotational speed of said respective drive motors and a parameter command signal which indicates parameter to set an operational condition and transmitting respective command signals via said common command signal transmission line to said respective drivers in various signal forms and said respective drivers distinguishing rotational speed command signals from said setting device and parameter command signals and controlling said respective drive motors according to the recognition.

[0008] A rotational speed command signal and a parameter command signal are transmitted individually by using the common command signal transmission line so that it is not necessary to install another transmission line to transmit parameter command signals.

[0009] The motor driving system of the present invention, said setting device is to transmit said parameter command signals to said respective drivers during the non-transmission period of said rotational speed command signals.

[0010] It is possible to set an operational condition for each driver without affecting rotation in each driving motor, since parameter command signals are transmitted to respective drivers during the non-transmission period of rotational speed command signals.

[0011] The motor driving system of the present invnetion, provided with a power line connected to said a plurality of drivers in order to supply driving power to said respective drive motors and a means for overlaying each command signal in said setting device on said power line, is to share said power line for said transmission line of command signals by connecting said setting device to said power line by using a means for overlaying.

[0012] Command signals of the rotational speed and parameter transmitted from the settling device are overlaid on the power line to transmit to respective drivers, therefore, it is unnecessary to install another transmission line for transmitting command signals of the rotational speed and parameter besides the power line.

[0013] The motor driving system of the present invention, in an individual-spindle-drive type textile machine, provided with a plurality of drivers individually controlling drive motors installed in each spindle unit and a setting device connected to a plurality of drivers via a common command signal transmission line is comprised of said

setting device providing a means for forming rotational speed command signals represented as a frequency according to an intended rotational speed of said respective drive motors and transmitting command signals via said common command signal transmission line to said respective drivers and said respective drivers providing a means for driving or stopping said drive motors according to the presence or absence of rotational speed command signals from said setting device.

[0014] As respective drive motors may be driven or stopped according to the presence or absence of rotational speed command signals, it is not necessary to install another transmission line to transmit command signals to drive or stop respective drive motors.

[0015] The motor driving system of the present invention is comprised of said respective drivers fitted with an operating switch to individually drive or stop said respective drive motors.

[0016] With the operation switch for unnecessary driving motors of spindle units selected "STOP", only necessary drive motors of spindle units may be operated even though rotational command signals are transmitted to all spindle units simultaneously.

Brief Description of the Drawings

[0017]

Figure 1 is an elevational schematic diagram showing a twisting machine employing a motor driving system for an individual-spindle-drive type textile machine applied the present invention in the implementation form.

Figure 2 is a structural diagram showing the motor driving system in Figure 1.

Figure 3 is a flow sheet showing a signal receiving process of a parameter command signal in respective motor drivers of the motor driving system in Figure 1.

Figure 4 is a flow sheet showing a signal receiving process of a command signal of a rotational speed in respective motor drivers of the motor driving system in Figure 1.

Figure 5 is a structural diagram showing an another example of the motor driving system.

Detailed Description of the Preferred Embodiments

[0018] The present invention will now be explained with reference to the accompanying drawings that show the implementation forms of the present invention applied to the motor driving system for the individual-spindle-drive type textile machine.

[0019] To begin with, the schematic configuration of the twisting machine in this implementation form is explained as follows. In Figure 1, 1 is a machine body of the twisting machine, 2 is a plurality of speed-adjustable drive motors placed side by side in the machine body 1, and 3 is spindles rotated on the same shaft by respective drive motors 2. Detachable supply yarn packages, mounted on the same shaft of respective spindles 3, are indicated as numeral 4 and to be kept standing still regardless of the rotation of respective spindles 3 with an appropriate braking means. 5 is a yarn guide to lead a yarn Y released from the supply yarn packages 4 to a winding apparatus, 6 is feed rollers to send the yarn Y to the winding apparatus while adjusting the tension of the yarn Y, 7 is traverse guides to traverse the yarn Y, and 8 is winding drums to make a winding packages 9 rotate by making contact with the surface. The traverse guide 7 is fitted on a traverse shaft 10 in each spindle unit and the traverse shaft 10 is reciprocated in such a direction as to point the shaft according to a driving mechanism beside a control box 15 mounted on the left side of the machine body 1. The winding drum 8 makes all spindle units rotate simultaneously.

[0020] In the above configuration of the twisting machine, the movement of twisting yarn in respective spindle units is to be done as follows.

[0021] The yarn Y, released from the supply yarn package 4, is led to downward from the tip of the spindle 3 through the inner part to be released from the lower part of spindle 3 rotating at high-speed. As the released yarn Y from the supply yarn package 4 is released while rotating, one twist is to be given in this stage. Furthermore, the yarn Y, released from the lower part of the spindle 3, is led to the feed roller 6 through the yarn guide 5 while rotating around the perimeter of the supply yarn package 4 according to the rotation of the spindle 3. In this stage, as the released yarn Y from the spindle 3 is spun around the supply package 4, it is given another twist. The twisted yarn Y, consequently twisted twice, is sent to the traverse guide 7 by the feed roller 6. The twisted yarn Y, adjusted tension to a designated level by the feed roller 6, is wound on the winding package 9 which is rotated by the winding drum 8, while being traversed by the traverse guide 7.

[0022] In this implementation form, as set forth in Figure 1, for instance, eight twisted yarn spindle units, mounted on the drive motor 2 to the winding drum 8, are arranged in a line in the sideward direction of the machine body 1 to comprise one group. In the practical twisting machine, a plurality of group are installed and operated under the host computer which is not shown in the figure.

[0023] Since the quality of the count of twist and so on for the twisted yarn Y wound by these respective spindle units varies according to the rotational speed of respective spindles 3, the rotation speed of the drive motor 2 in each spindle unit is to be controlled accurately according to command signals from a signal setting device 50 and also monitored accurately the rotational speed of the drive motors 2 in respective spindle units in order to avoid dispersion between respective spindle units and maintain the quality of the twisted yarn Y uniformly.

[0024] The control of respective driving motors 2 is carried out by a plurality of motor drivers 30. Respective motor drivers 30 control respective driving motors 2 according to command signals from the signal setting machine 50, moreover, the signal setting device 50 is operated under the host computer. These respective motor drivers 30, connected to an AC/DC transducer 45 fitted in the control box 15, supply respective drive motors 2 with drive power and generate control power.

[0025] The following is the description regarding the configuration of the motor driving system in the implementation form.

[0026] In Figure 2, said signal setting device 50, fitted inside of the control box 15, is to transmit command signals to respective motor drivers 30 with the instruction from a host computer and comprised of a microcomputer with a timer circuit and so on. This signal setting device 50, with a microcomputer, forms the rotational speed command signals configured with pulse train of frequency according to an intended rotational speed of respective drive motors 2 and parameter command signals (code signals) of a designated bit showing the parameter to set the operational condition, then transmit respective command signals individually to respective motor drivers 30. One example of parameter to set the operational condition is rotational directions to perform S-twist or Z-twist on twisted yarn Y in case of using a multi-twisting machine.

[0027] Said each motor driver 30, which is an inverter module controlling respective drive motors 2, is comprised of a microcomputer, an inverter circuit, and so forth. These respective motor drivers 30 are connected to the signal setting device 50 with a common command signal transmission line 40. Each motor driver 30 distinguishes the rotational speed command signal from a parameter command signal with reference to the formation of a command signal received from the signal setting machine 50 via the common command signal transmission line 40, furthermore, it controls the rotation of respective drive motors 2 according to command signals of the rotational speed and parameter and monitors the rotational speed of drive motors 2 with reference to the detected data of the a rotation sensor 35. Each motor driver 30 is connected to the AC/DC transducer 45 with a common power line 46. Each motor driver 30 decompresses direct current voltage, converted by the AC/DC transducer 45 from an alternating current power source 47, to generate a control power. Moreover, each motor driver 30 is provided with an operating switch 60 to respectively select to drive or stop each drive motor 2. Regarding the drive motors 2 of spindle units which are not necessary to operate, with the operational switch 60 selected in the "STOP" position, only necessary drive motors 2 of spindle units may be operated even though each command signal is transmitted via the common command signal transmission line 40 to all the spindle units (all drive motor 2) simultaneously. In addition, in this implementation form, as one motor driver 30 controls each drive motor 2 individually, the motor driver 30 can be installed at every plural spindle units when respective drive motors 2 are controlled individually. When one drive motor 2 is connected for one motor driver 30, one operating switch 60 is supposed to be installed for each motor driver 30. In the case of connecting "n" pieces of the drive motor 2 for one motor driver 30, "n" pieces of the operating switch 60 are to be installed for respective motor drivers 30.

[0028] The following is the description regarding the transmission process in said motor driving system, referring Figure 3 and Figure 4 in addition to Figure 2.

[0029] In the motor driving system, supposing all of the operating switches 60 are selected in the drive position and respective drive motors 2 are ready for an operation. This motor driving system, for instance, drives and controls the rotation of respective drive motors 2 after setting the operational condition for each motor driver 30 before starting to operate all spindle units in the twisting machine.

[0030] Referring first to Figure 2, as for setting the operational condition, the signal setting device 50 forms and transmit the parameter command signal matching the designated number of bits indicated the parameter to set the operational condition. Then, as shown in Figure 3, each motor driver 30 confirms the input of the pulse train for the rotational speed command signals in the process of S1. In the case of this input number failed to be confirmed, each motor driver 30 confirms the input level for the parameter command signals in the process of S2. If the input level is in high-level (H), it receives the serial transmitted parameter command signal from the signal setting device 50 in the process of S3. This parameter command signal represented as the designated bit number is generally started to transmit from high-level. Therefore, selecting the input level for each motor driver 30 high-level (H) changes the mode which allows each motor drivers 30 to accept parameter command signals. In the process of S4, respective motor drivers 30 carry out data processing on received parameter command signals to set an operational condition and send the confirmation for received parameter command signals to the signal setting device 50 in the process of S5. This parameter command signal, as shown in Figure 2, is serial-transmitted to each motor driver 30 via the common transmission line of command signals 40. Once input of each pulse train is confirmed in the process of S1, each motor driver 30 select the mode to drive and control the rotation of each drive motor 2. If the input level is in low-level (L) in the process of S2, each motor driver 30 is in stand-by state, ready to start for the rotation of respective motor drivers 30.

[0031] Therefore, with transmitting parameter command signals via the common command signal line 40 to each motor driver 30 before starting to operate a twisting machine, it is possible to set an operational condition without affecting the rotation of each drive motor 2. The transmission of parameter command signals is not lim-

ited to be done before the operation of a twisting machine and it is possible to transmit except for the duration of the rotational speed command signals transmitted from the signal setting device 50, i.e. except when each drive motor 2 rotates.

[0032] The following is the description regarding the rotational control of each drive motor 2 by each motor driver 30. When an operational condition is set for each motor driver 30, the signal setting device 50, as shown in Figure 2, forms and transmit the rotational speed command signal of pulse train frequency according to the intended rotational speed of each drive motor 2. As shown in Figure 2, this rotational speed command signal is transmitted to each motor driver 30 via the common command signal transmission line 40. Then each motor driver 30 confirms the input of pulse train of the rotational speed command signal in the process of S1' as stated in Figure 4. Once this input is confirmed, the rotational speed command signal is gone through the data processing in the process of S2' and the pulse train frequency is counted in the process of S3'. In the process of S4', respective motor driver 30 set the counted pulse train frequency as a setting speed variable. In the process of S5', respective motor drivers 30 start to drive each drive motor 2 according to the confirmation for received the pulse train and control the rotation of each drive motor 2 in order to meet the operational condition of parameter command signals and the rotational speed according to the pulse train. In the process of S6', when each motor driver 30 receives the pulse train continuously, each drive motor 2 continues driving. When it stops receiving the pulse train, each drive motor 2 stops in the process of S7'. In the case each motor driver 30 fails to confirm the pulse train in the process of S1', it is switched to the mode for receiving parameter command signals.

[0033] Thus, each motor driver 30 is capable of receiving command signals of parameter and the rotational speed individually via the common command signal transmission line by selecting the mode of receiving command signals of parameter or the mode of driving and controlling the rotation of each drive motor 2, so that another transmission line to transmit parameter command signals is not necessary to be installed.

[0034] As each motor driver 30 drives or stops respective drive motors 2 in accordance with the presence or absence of receiving pulse train of rotational speed command signals, it is not necessary to install transmission line to transmit command signals to drive or stop each drive motor 2.

[0035] The pulse train frequency, formed and transmitted by the signal setting device 50, is to be high in order to increase the rotational speed while each drive motor 2 is rotating. As shown in Figure 2, the high pulse train frequency is transmitted via the common command signal transmission line 40 to each motor driver 30. As each motor driver 30 goes through the process of S1' to S5' shown in Figure 4, it speeds up the rotation of the drive motor 2 in accordance with high pulse train frequency.

[0036] Thus, it is possible to change the rotational speed of each drive motor 2 at the same speed, if high pulse train frequency is transmitted simultaneously to each motor driver 30 via the common command signal transmission line 40.

[0037] Furthermore, regarding the drive motors 2 of spindle units which are not necessary to operate in a twisting machine, with the operational switch 60 of the motor driver 30 according to drive motors 2 selected in the "STOP" position, only necessary drive motors 2 of spindle units may be operated, even though each command signal is transmitted via the common command signal transmission line 40 to all the spindle units (all of motor divers 30) simultaneously .

[0038] The following is the description regarding an another example of the motor driving system in this implementation form.

[0039] In Figure 5, the motor driving system is to share the power line 46 for the transmission line of command signals 40 and overlay each command signal from the signal setting device 50 upon the power line 46 to transmit. In the Figure 5, the same signs in Figure 1 and Figure 2 show the same parts and the explanation is omitted.

[0040] As shown in Figure 5, 55 is an overlay device comprising a transformer 56, a modulator 57, and so forth. A primary side coil 56a in the transformer 56 is connected to the modulator 57 in a control box 15 and a secondary side coil 56b is connected to the power line 46 in the control box 15. The modulator 57, connected to the signal setting device 50 in the control box 15, modulates command signals of parameter and the rotational speed from the signal setting device 50 to an alternating-current voltage according to each command signal. In this motor driving system, each command signal transmitted from the signal setting device 50 is modulated to an alternating-current voltage by the modulator 57 to induce the alternating-current voltage according to each command signal on the power line 46 by the transformer 56. As a result of this, the alternating-current voltage according to each command signal is overlaid on the direct-current voltage from the AC/DC transducer 45 on the power line 46 and the alternating-current voltage according to each command signal is transmitted to each motor driver 30 via the common power line 46. Each motor driver 30 demodulates and extracts contents of the alternating-current voltage corresponded to each command signal by a demodulate circuit and so forth to receive command signals of parameter and the rotational speed. In the case of receiving a parameter signal, a signal may be binarized according to the difference in frequency of an alternating-current voltage, for example, a code showing the parameter signal can be recognized by identifying frequency higher than the designated frequency as 1 and lower frequency as 0. In the motor driving system seen in Figure 5, respective motor driv-

ers 30 implement a signal receiving process in the same manner as Figure 3 and Figure 4.

[0041] Thus, since command signals of the rotational speed and parameter, transmitted from the signal setting device 50, overlays on the power line 46 to transmit to respective motor drivers 30, it is not necessary to install another transmission line to transmit command signals of the rotational speed and parameter besides the power line 46.

[0042] As mentioned above, a multi-twisting machine is taken as an example in the implementation form of this invention. The present invention is also applicable to a motor driving system for a false twist processing machine and all sorts of the individual-spindle-drive type textile machine.

[0043] As described above, in accordance with the present invention, on the grounds of sharing a common command signal transmission line to transmit command signals of the rotational speed and parameter to each driver, it is not necessary to install another transmission line to transmit parameter command signals. As a consequence, the number of transmission lines to transmit each command signal from the signal setting device may be reduced, therefore, in the case of an individual-spindle-type textile machine which comprises multi-spindle units, the man-hour and the cost of wiring for a plurality of spindle units can be reduced.

[0044] In accordance with the present invention, since parameter command signals are transmitted to each driver before starting to operate each drive motor, it is possible to set an operational condition without interfering the rotation of each drive motor.

[0045] In accordance with the present invention, as command signals of the rotational speed and parameter, transmitted from a setting machine, overlay upon a power line to transmit to each driver, there is no need to install another transmission line to transmit command signals of the rotational speed and parameter and the man-hour and the cost of wiring may be reduced by decreasing the number of transmission lines.

[0046] In accordance with the present invention, as each drive motor may be driven or stopped according to the presence or absence of rotational speed command signals, it is not necessary to install another transmission line to transmit command signals to drive or stop each drive motor. As a consequence, the number of transmission lines to transmit each command signal from the signal setting device can be reduced, resulted in reducing the man-hour and the cost of wiring for a plurality of spindle units in an individual-spindle-drive type textile machine.

[0047] In accordance with the present invention, with the operational switch selected in the "STOP" position for drive motors of spindle units which are not necessary to operate, only necessary drive motors of spindle units may be operated, even though the rotation command signal is transmitted to all the spindle units simultaneously.

Claims

1. A motor driving system for an individual-spindle-drive type textile machine, provided with a plurality of drivers individually controlling drive motors fitted in respective spindle units and a setting device connected to a plurality of drivers via a common transmission line of command signals, comprising:

   said setting device providing means for forming a rotational speed command signal of frequency according to an intended rotational speed of said respective drive motors and parameter command signals which indicate a parameter to set an operational condition and transmitting respective command signals in different signal forms via said common transmission line of command signals to said respective drivers; and

   said each driver providing means for distinguishing between the rotational speed command signal and the parameter command signal received from said setting device and controlling said respective drive motors according to the recognition.

2. A motor driving system for an individual-spindle-drive type textile machine according to claim 1 **characterized in that** said setting device transmits said parameter command signal to said respective drivers during a non-transmission period of said rotational speed command signal.

3. A motor driving system for an individual-spindle-drive type textile machine according to claim 1 or claim 2, provided with a power line connected to a plurality of said drivers in common to supply driving power to said respective drive motors and means for overlaying each command signal from said setting device on said power line, **characterized in that** said setting device connected to said power line via said means of overlaying to share said power line for said transmission line of command signals.

4. A motor driving system for an individual-spindle-drive type textile machine, provided with a plurality of drivers individually controlling drive motors fitted in respective spindle units and a setting device connected to a plurality of drivers via a common transmission line of command signals, comprising:

   said setting device providing means for forming the rotational speed command signal represented as a frequency according to an intended rotational speed of said respective drive motors and transmitting the command signal via said common transmission line of command signals

to said respective drivers; and
said respective drivers providing means for driving or stopping said drive motors according to the presence or absence of rotational speed command signals from said setting device.

5. A motor driving system for an individual-spindle-drive type textile machine according to claim 4 **characterized in that** said each driver is provided with an operational switch to individually select to drive/stop said each drive motor.

6. A motor driving system for an individual-spindle-drive type textile machine according to any one of claims 1 to 5 **characterized in that** said drive motors is to drive spindles for twisted yarn and **in that** said each driver is an inverter module to control said drive motors.

7. A motor driving system for an individual-spindle-drive type textile machine according to claim 6 **characterized in that** said parameter includes a rotational direction of said drive motors.

FIG. 1

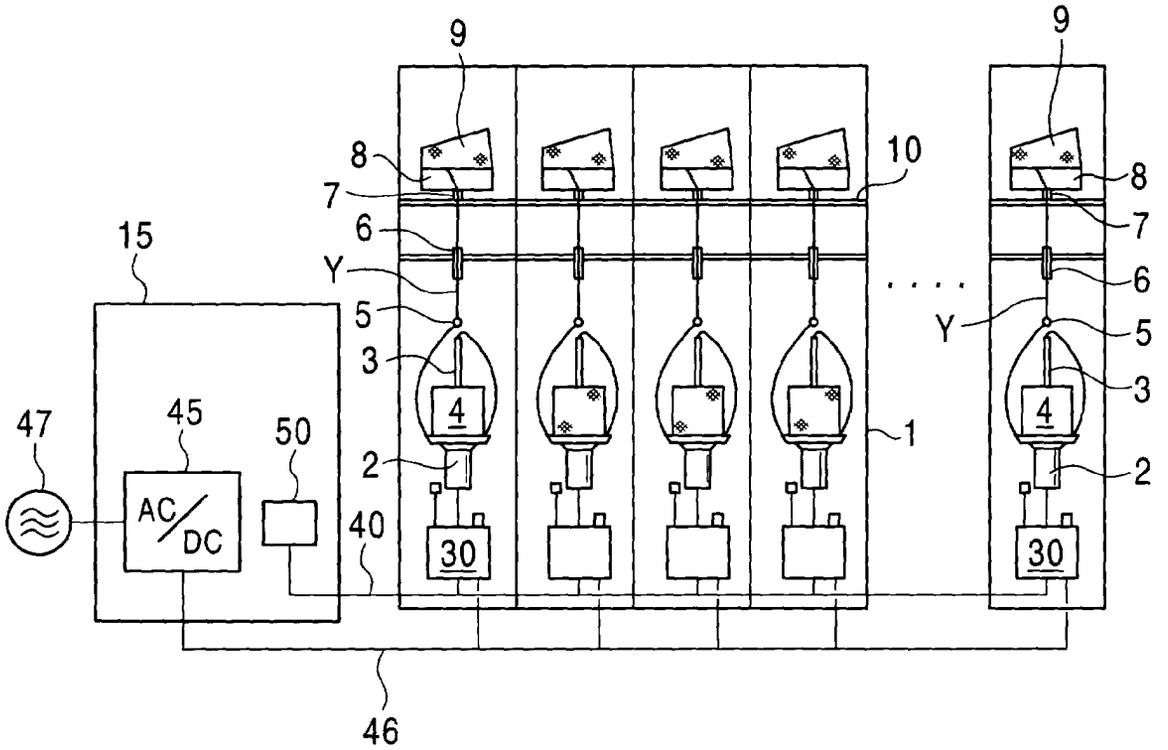


FIG. 2

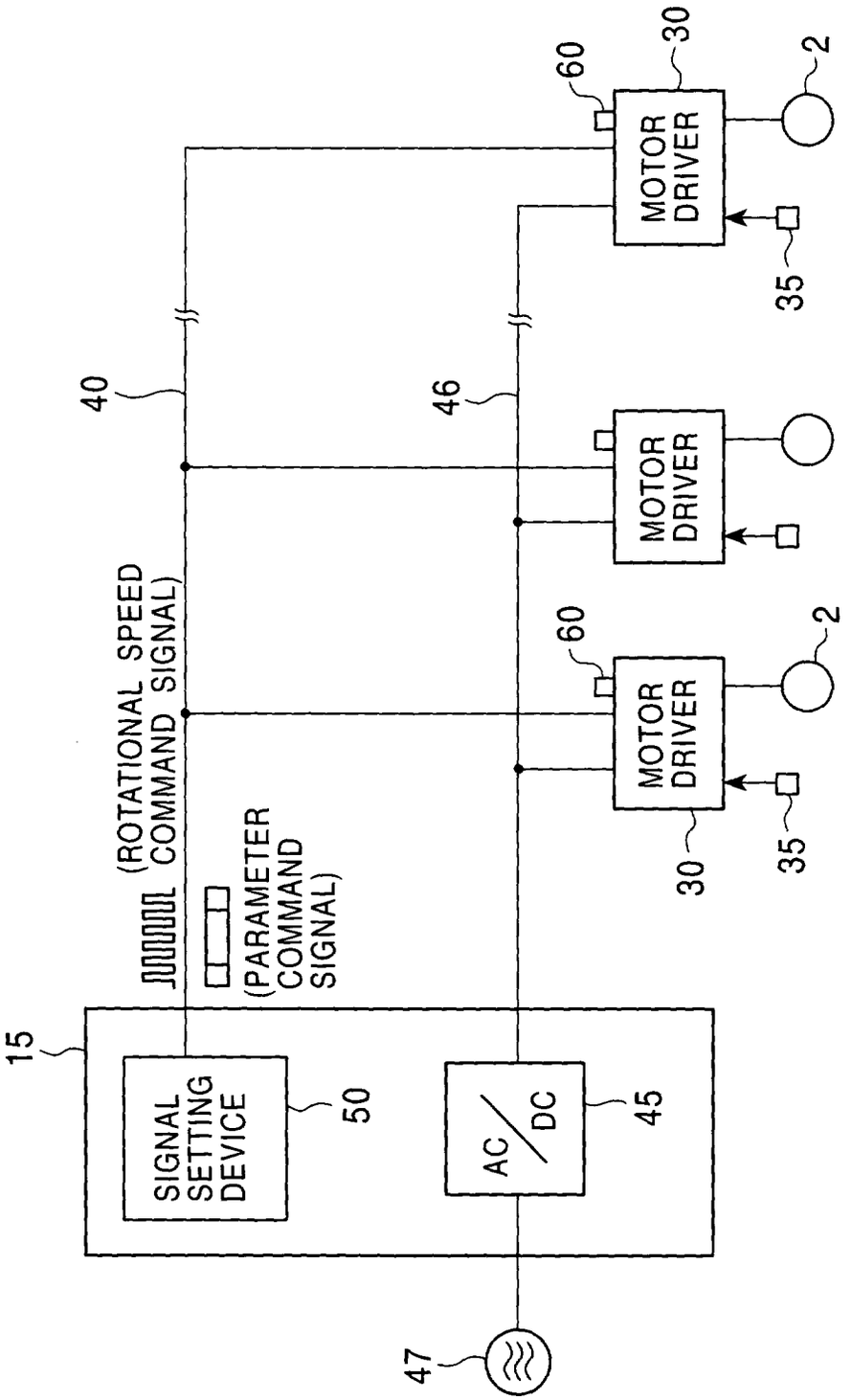

15
SIGNAL SETTING DEVICE
50
AC/DC
45
47
(ROTATIONAL SPEED COMMAND SIGNAL)
(PARAMETER COMMAND SIGNAL)
40
46
MOTOR DRIVER
30
60
2
35

FIG. 3

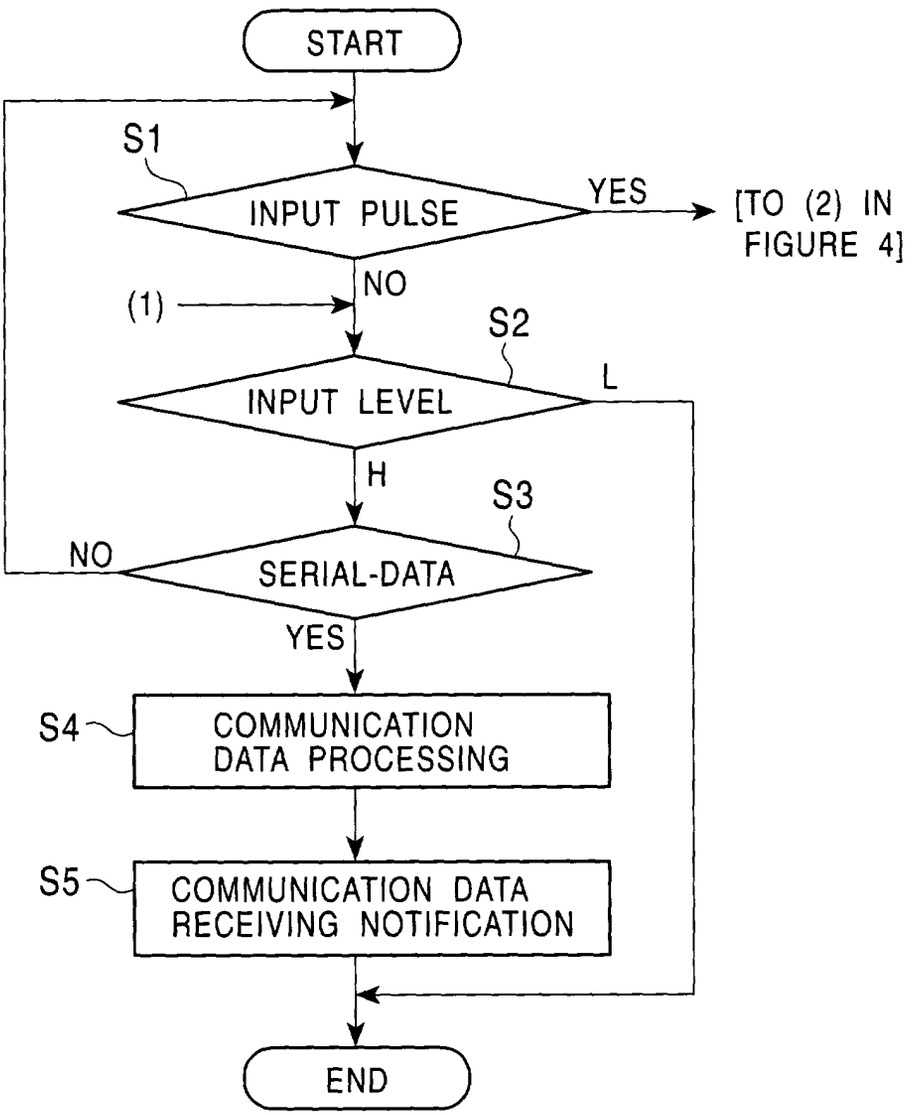

START
S1
INPUT PULSE
YES
[TO (2) IN FIGURE 4]
NO
(1)
S2
INPUT LEVEL
L
H
S3
NO
SERIAL-DATA
YES
S4
COMMUNICATION DATA PROCESSING
S5
COMMUNICATION DATA RECEIVING NOTIFICATION
END

FIG. 4

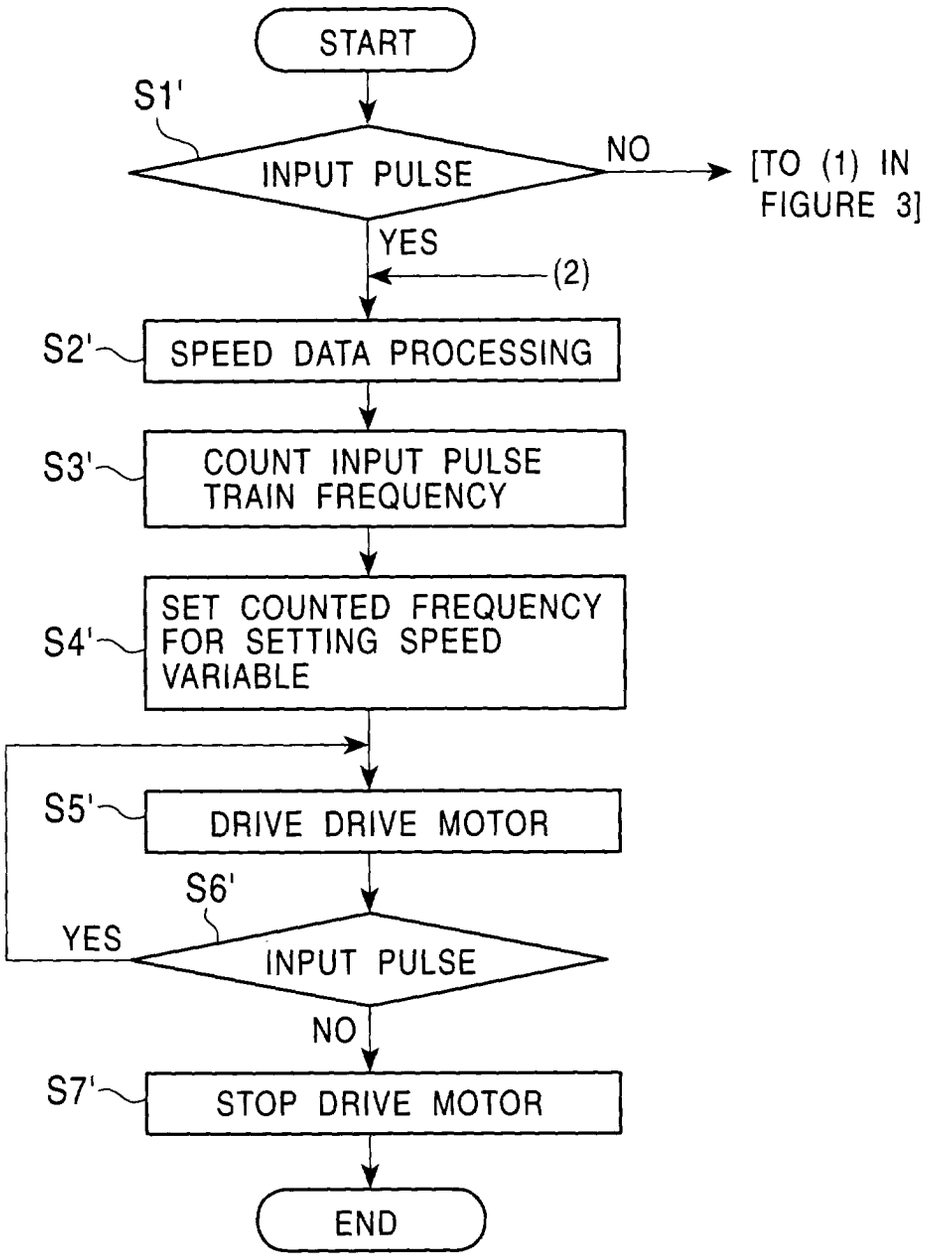
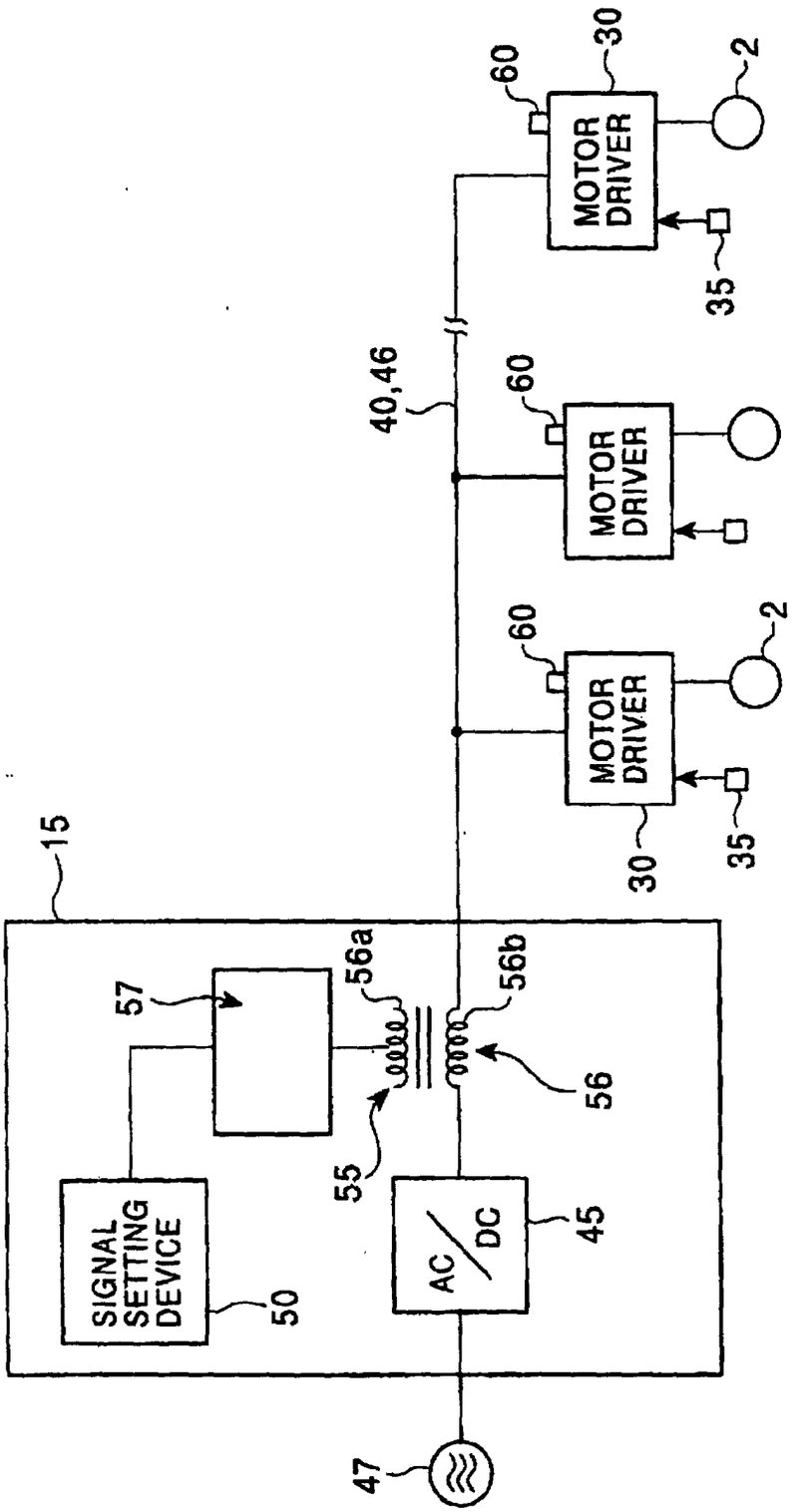

START
S1'
INPUT PULSE
NO
[TO (1) IN FIGURE 3]
YES
(2)
S2'
SPEED DATA PROCESSING
S3'
COUNT INPUT PULSE TRAIN FREQUENCY
S4'
SET COUNTED FREQUENCY FOR SETTING SPEED VARIABLE
S5'
DRIVE DRIVE MOTOR
S6'
YES
INPUT PULSE
NO
S7'
STOP DRIVE MOTOR
END

FIG. 5


15
47
SIGNAL SETTING DEVICE
50
AC/DC
45
55
57
56a
56b
56
40,46
MOTOR DRIVER
60
30
35
2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 11 3303

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 08, 6 October 2000 (2000-10-06) & JP 2000 144536 A (TOYOTA AUTOM LOOM WORKS LTD), 26 May 2000 (2000-05-26)	4	D01H1/244 D01H1/34
Y	* abstract *	5,7	
Y	EP 0 950 735 A (MURATA MACHINERY LTD) 20 October 1999 (1999-10-20)	5,7	
A	* column 7, line 26 - line 48 * * column 9, line 46 - line 19; figures 1,3 *	1-3,6	
Y	EP 0 989 498 A (TOYODA AUTOMATIC LOOM WORKS) 29 March 2000 (2000-03-29) * column 1, line 38 - line 54 *	5	
A	* column 5, line 10 - line 16 *	1-3,6,7	
A	US 4 408 447 A (SLOUPENSKY JIRI ET AL) 11 October 1983 (1983-10-11) * column 4, line 45 - column 5, line 25; figures 1-4 *	1-7	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 December 2001	Henningsen, O

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 11 3303

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04-12-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000144536 A	26-05-2000	NONE	
EP 0950735 A	20-10-1999	JP 11302929 A	02-11-1999
		CN 1232095 A	20-10-1999
		EP 0950735 A1	20-10-1999
EP 0989498 A	29-03-2000	JP 2000073238 A	07-03-2000
		EP 0989498 A2	29-03-2000
US 4408447 A	11-10-1983	CS 201779 B1	28-11-1980
		CH 646207 A5	15-11-1984
		DE 2932653 A1	20-03-1980
		FR 2435541 A1	04-04-1980
		GB 2032968 A ,B	14-05-1980
		IT 1165299 B	22-04-1987
		JP 55052103 A	16-04-1980

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82