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(54) FEEDING AND CURLING DEVICE FOR SPRING MAKING MACHINES

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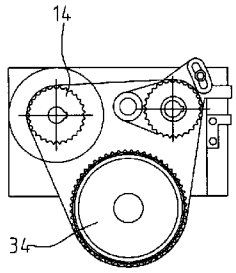
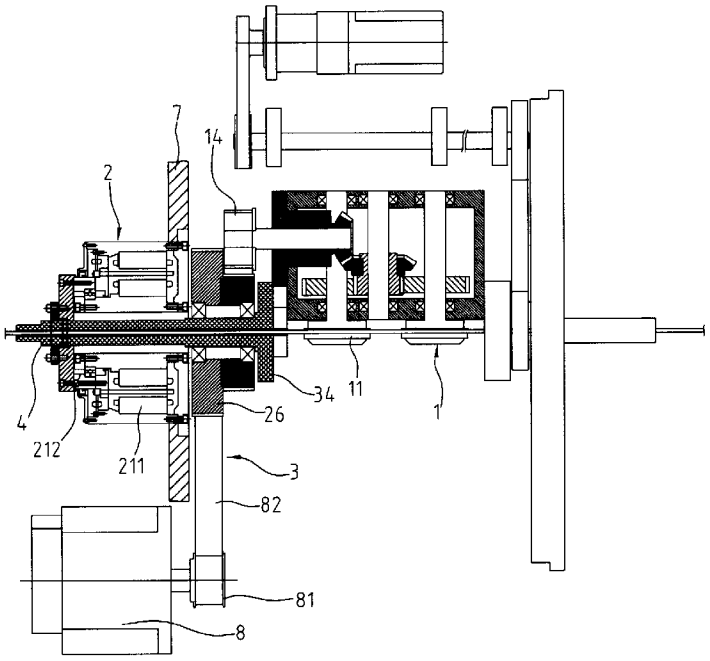
(57) **ABSTRACT**

A spring making machine includes a curling device and a feeding device. The curling device has a shaft which is driven by a first servo motor so as to ensure the precise movement of the metal line. The feeding device has a second servo motor connected to the shaft and the rotor of the second servo motor has a hole through which the shaft extends. The rotor of the second servo motor is engaged with the gear for feeding the metal line on the shaft so as to reduce the volume the mechanism occupies.





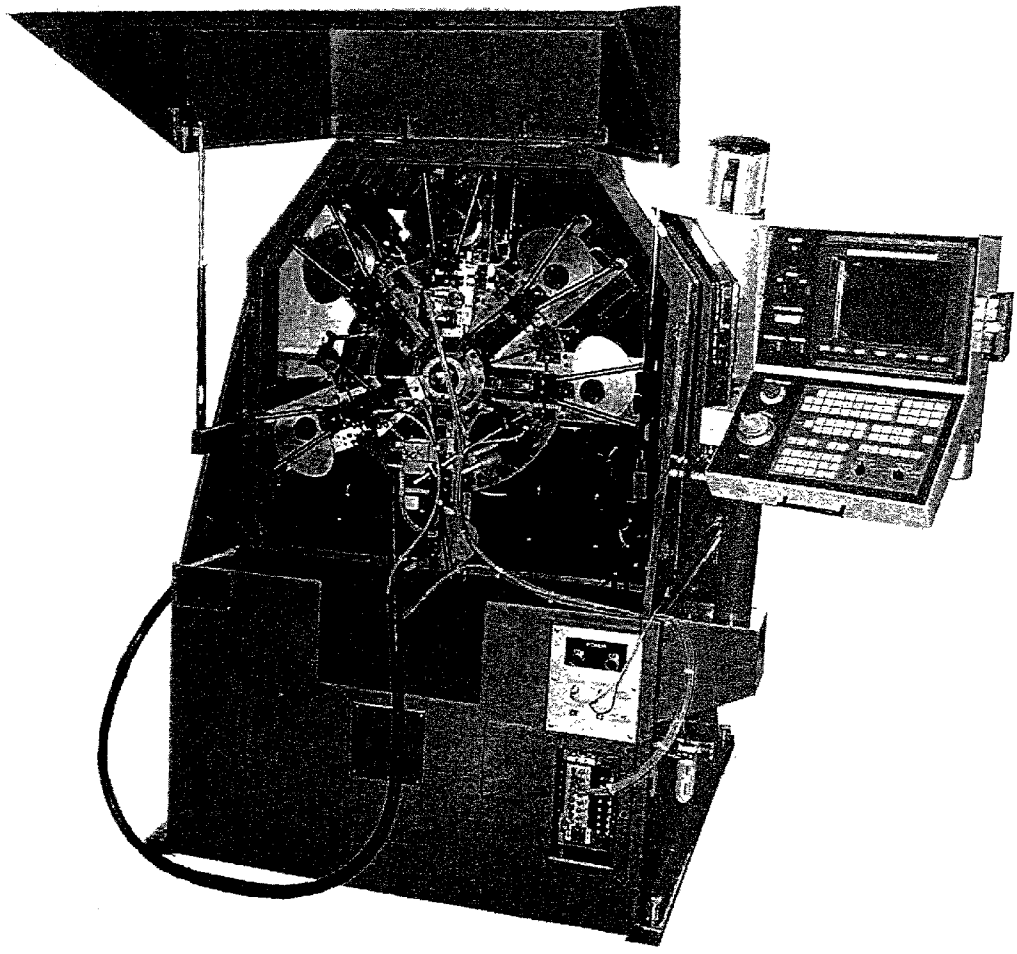


FIG. 1 (PRIOR ART)

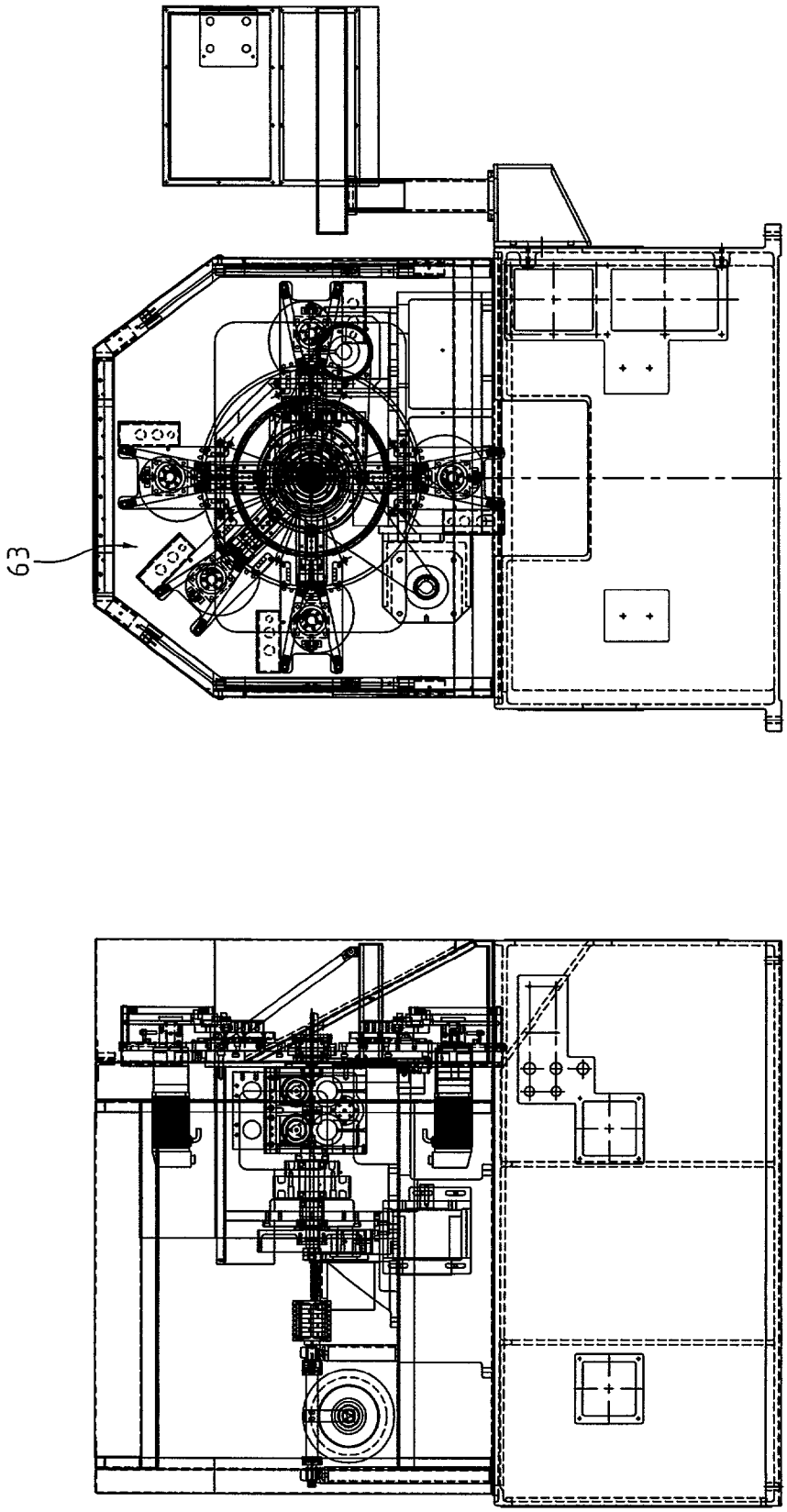


FIG. 2 (PRIOR ART)

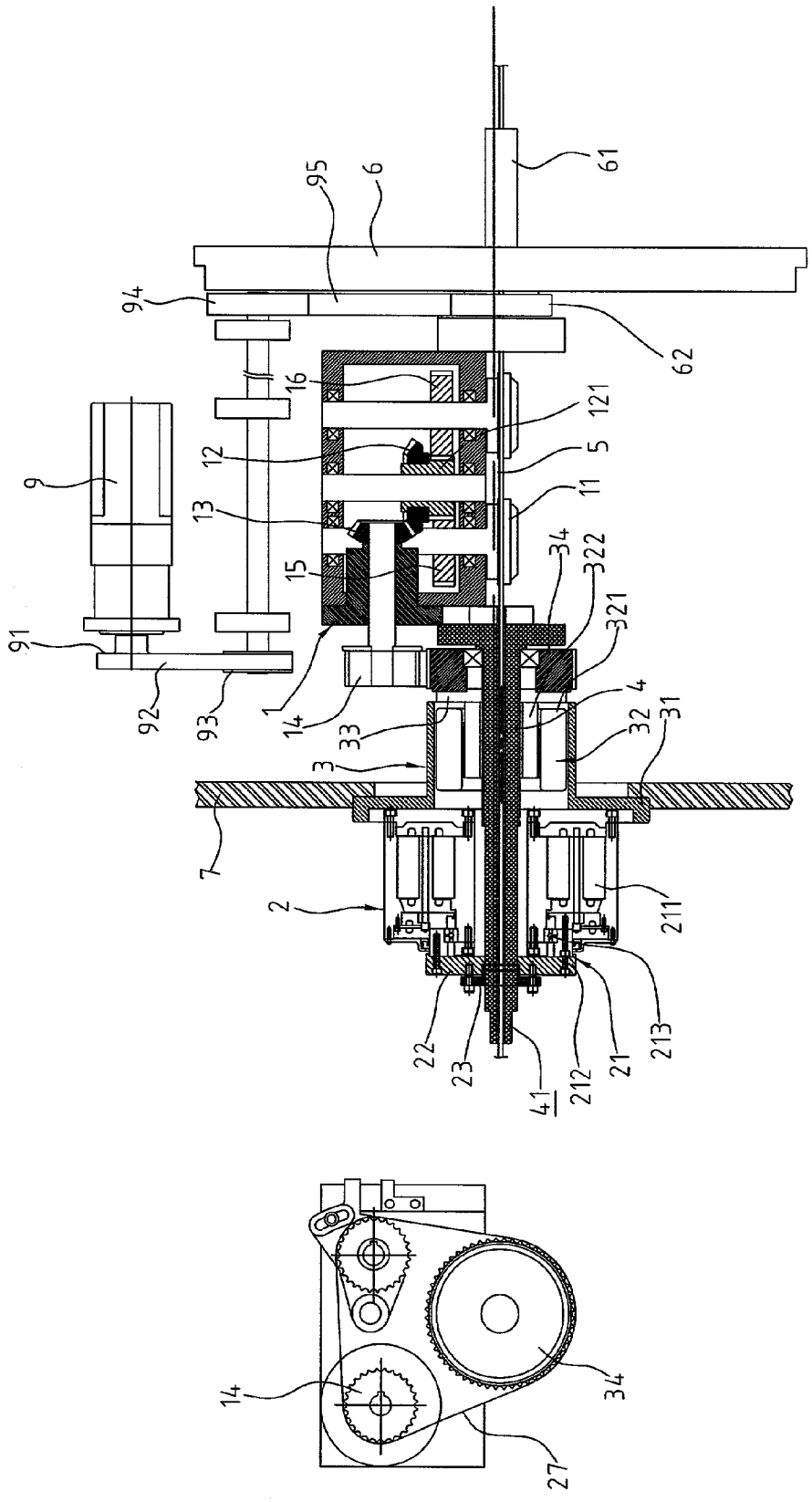

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FIG. 3

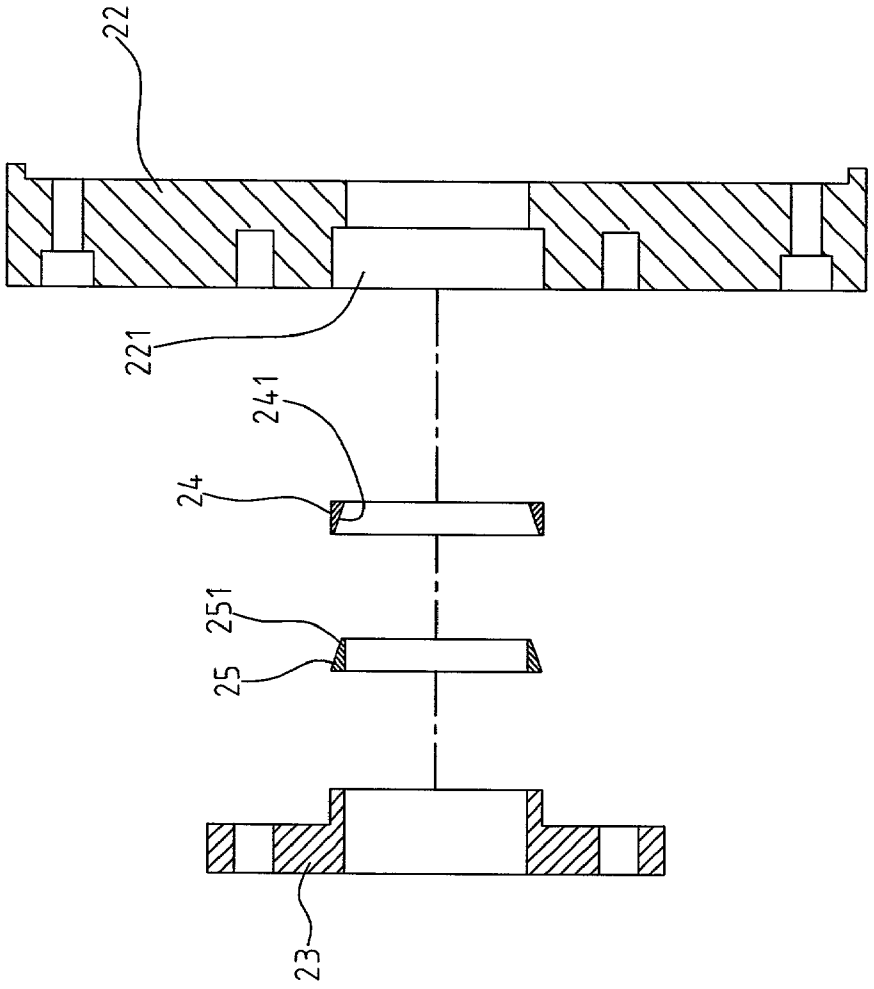

FIG. 4

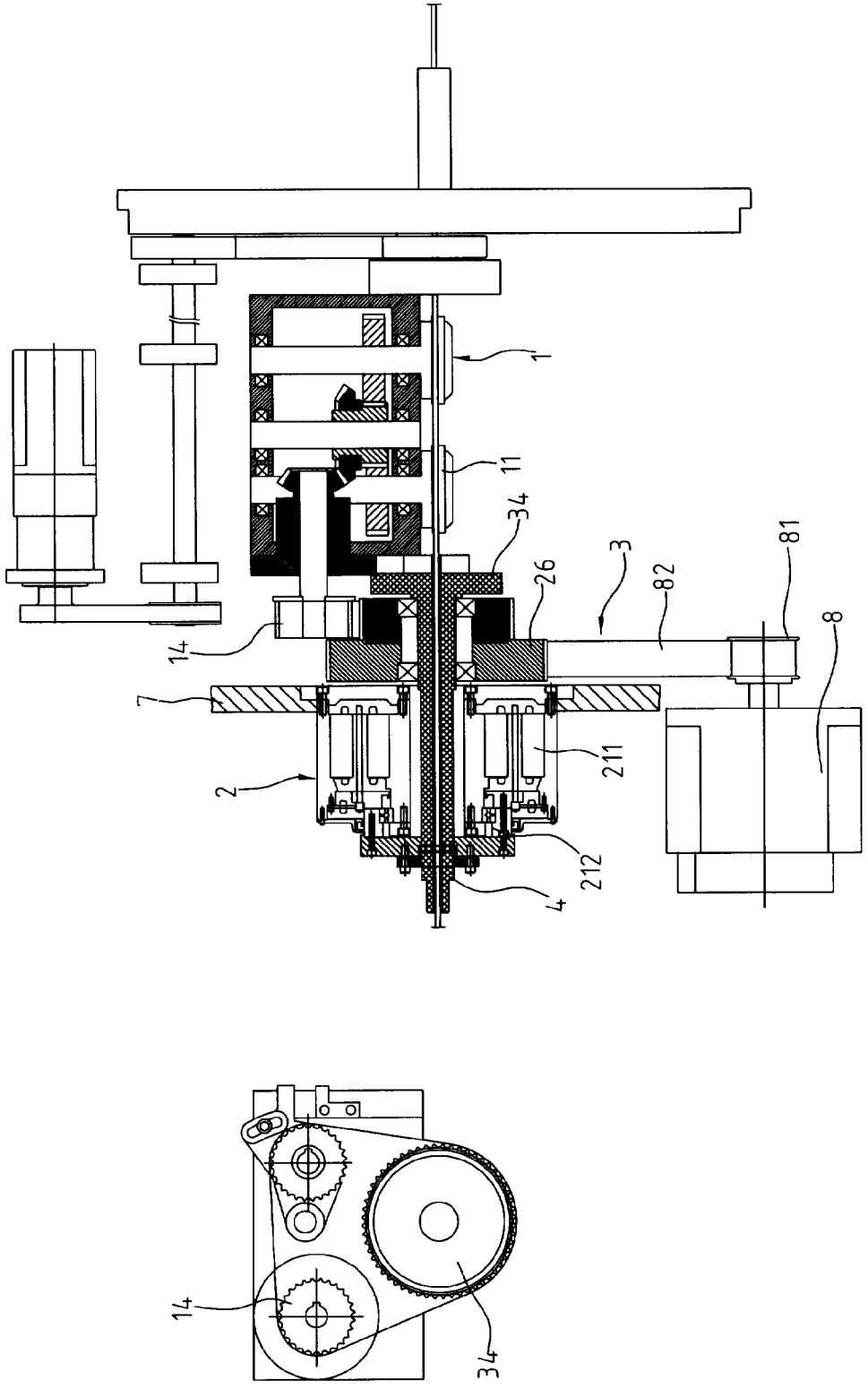

FIG. 5

FEEDING AND CURLING DEVICE FOR SPRING MAKING MACHINES

FIELD OF THE INVENTION

[0001] The present invention relates to a feeding device and curling device for a spring making machine and includes two servo motors to feed the line and rotate the line precisely.

BACKGROUND OF THE INVENTION

[0002] A conventional spring making machine as shown in **FIGS. 1 and 2** includes a plurality pairs of rollers and a metal line to be made to be a spring is clamped between the rollers which move the metal line forward to a curling section of the machine. A forming member clamps an end of the metal line and curls the end of the metal line to be a desired angled end. The metal line is fed to a disk which makes the metal line to be coil shape. Another forming member is then used to make the other end of the spring to be a desired angled end. A cutting means to cut the spring into desired length. In order to make various types of angled ends, there are many forming members installed on the machine so that it is difficult to make a small angle for the end of the spring. Although some spring making machines have rotating devices that rotate the spring according to the input date into the computer and another forming member is then used to bend the end of the spring.

[0003] Nevertheless, the rollers have to be released from the metal line when the metal line is to be rotated. This makes the time required to finish the processes to be longer than can be accepted. Besides, when the rollers are released from clamping the metal line, the metal line could be moved or shifted during the curling and this affects the precision of the spring.

SUMMARY OF THE INVENTION

[0004] The present invention relates to a spring making machine which includes a curling mechanism and a feeding mechanism. The curling mechanism has a shaft with a first servo motor which rotates the shaft to curl the spring. The feeding mechanism includes a second servo motor which has a hole through which the shaft extends. The rotor of the second servo motor is engaged with the feeding gears on the shaft.

[0005] The primary object of the present invention is to provide a spring making machine which includes concise mechanism and can precisely make springs.

[0006] The present invention will become more obvious from the following description when taken in connection with the accompanying drawings which show, for purposes of illustration only, a preferred embodiment in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **FIG. 1** is a conventional spring making machine;

[0008] **FIG. 2** shows the front and side view of the conventional spring making machine;

[0009] **FIG. 3** shows the front view and the side view of the feeding device and the curling device of the spring making machine of the present invention;

[0010] **FIG. 4** is an exploded view to show the output member, the first decline fastening member, the second decline fastening member and the fastening plate of the curling device of the spring making machine of the present invention, and

[0011] **FIG. 5** shows the front view and the side view of another embodiment of the feeding device and the curling device of the spring making machine of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Referring to **FIGS. 2 and 3**, the spring making machine of the present invention has a shaft which is driven by power that is provided from outside.

[0013] As shown in **FIG. 3**, the spring making machine includes a curling device **2** and a feeding device **3**, both of which are connected to a base **7**. The feeding device **3** has a fixed frame **31** fixed on the base **7** and having a chamber therein. A second servo motor **32** is received in the chamber of the fixed frame **31** and the stator **321** is fixedly installed in the chamber. The rotor **322** has a hole through which the shaft **4** extends which does not contact the rotor **322** so that the rotor **322** and the shaft **4** can be rotated independently. A connection member **33** is connected to the rotor **322** and a gear **34**. The shaft **4** has a passage **41** for the metal line **5** passing therethrough. A trans-roller unit **1** is connected to an end of the shaft **4** so as to transport the metal line **5** by the rollers **11** of the trans-roller unit **1**.

[0014] The curling device **2** includes a first servo motor **21** fixedly connected to the frame **31** and located on the shaft **4**. The stator **211** of the first servo motor **21** is fixed to the frame **31** and bearings **213** are connected between the rotor **212** and the stator **211** so that the stator **211** and the rotor **212** are able to be rotated independently. The rotor **212** is connected to an output device. As shown in **FIG. 4**, the output device **4** includes an output member **22**, a first decline fastening member **24**, a second decline fastening member **25** and a fastening plate **23**. The output member **22** has a central hole **221** and the first decline fastening member **24** has a tapered inner periphery **241**, and the second decline fastening member **25** has a tapered outer periphery **251**. The first decline fastening member **24** is inserted in the central hole **221** and the second decline fastening member **25** is inserted in the tapered inner periphery **241** of the first decline fastening member **24**. The fastening plate **23** is then mounted to the second decline fastening member **25**. The shaft **4** extends through the fastening plate **23**, the first decline fastening member **24**, the second decline fastening member **25** and the output member **22**. Bolts are used to connect the output member **22** and the fastening plate **23** so that the fastening plate **23** is able to push the second decline fastening member **25** to move along the shaft **4**. The tapered outer periphery **251** is limited by the tapered inner periphery and retracted toward the central direction so position the shaft **4**.

[0015] The trans-roller unit **1** has a disk **6** on a side thereof and an output shaft **61** connected to the disk **6** so that the metal line **5** may go through the output shaft **61**. A gear **62** is mounted to the output shaft **6** and a plurality of forming members **63** as shown in **FIG. 2** are connected to the other side of the disk **6**. A toothed belt **95** is connected between the gear **62** and the gear **94**. The gear **94** is co-axially connected

to a gear **93** which is connected to an active gear **91** of the servo motor **9** by a toothed belt **92**. Therefore, when the servo motor **9** rotates, the disk **6** is rotated via the gears **92**, **93**, **94** and **62**. The shaft **4** is rotated when the first servo motor **21** drives the output member **22**. The second servo motor **32** drives the gear **34** which is connected to the gear **14** of the trans-roller unit **1** via the toothed belt **27**. The gear **34** drives the gear **14** of the trans-roller unit **1** and the direction of the power is changed via the active bevel gear **13** and the passive bevel gear **12**. The metal line **5** is then transported by the rollers **11** of the trans-roller unit **1**.

[**0016**] The trans-roller unit **1** is located between the shaft **4** and the output shaft **61** so that the trans-roller unit **1** is rotated together with the shaft **4** and the output shaft **61**. The trans-roller unit **1** has a box-like body in which turning mechanism is received which includes a shaft extending in the body and is connected to an active bevel gear **13**. The trans-roller unit **1** may have one set of a top and a bottom roller, or two sets of the top and bottom roller. This embodiment employs two sets of the top roller and bottom roller. An other shaft is located in the body and connected to a passive bevel gear **12** which is engaged with a first gear **15** and a second gear **16**. The first gear **15** and the second gear **16** are cooperated with each other, and the passive bevel gear **12** is engaged with the active bevel gear **13**. The roller **11** has a groove so that the metal line **5** is engaged with the two aligned grooves of the top roller **11** and the bottom roller **11**.

[**0017**] The metal line **5** is clamped between the top and bottom roller **11** after it extends through the passage **31** of the shaft **4**. The metal line **5** extends through the shaft **61** and the disk **6**. When operating, the gear **34** is driven by the second servo motor **32** and the gear **14** drives the active bevel gear **13** which rotates the passive bevel gear **12**. The co-axial gear **121** is rotated with the passive gear **12** and drives the first gear **15** and the second gear **16**. Therefore, the metal line **5** is moved by the rollers **11** toward the disk **6**. When the metal line **5** is to be curled, by the computer, the first servo motor **21** drives the output member **22** and the shaft **4** and the output shaft **61** of the trans-roller unit **1** are rotated. In other words, the metal line **5** can be curled while still be fed toward the disk **6**.

[**0018**] Another embodiment of the present invention is shown in **FIG. 5** wherein the first servo motor **21** of the curling device **2** is connected to the shaft **4** and the stator **211** is fixed to the base **7**, and the rotor **212** is connected to the shaft **4** by the output member as the previous embodiment. The feeding device **3** in this embodiment has a third servo motor **8** which replaces the second servo motor in **FIG. 3**. A gear **26** is connected to the shaft **4** and a gear **34** which is engaged with a gear **14** of the trans-roller unit **1**. The gear **81** of the third servo motor **8** is connected to the gear **26** by a toothed belt **82**. The third servo motor **8** drives the gears **26** and **34**, and the gear **34** drives the gear **14** so as to feed the metal line by the rollers **11**.

[**0019**] While we have shown and described the embodiment in accordance with the present invention, it should be clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

What is claimed is:

1. A spring making machine comprising:

a curling device having a shaft and a first servo motor connected to the shaft, the first servo motor having a rotor which is fixed to the shaft so that the shaft is driven by the first servo motor;

a feeding device having a second servo motor connected to the shaft and which has a hollow rotor through which the shaft extends, the rotor driving a gear on the shaft and

a trans-roller unit which is driven by the gear on the shaft.

2. The machine as claimed in claim 1, wherein the rotor of the first servo motor is connected to an output member which is fixed to the shaft so that the first servo motor drives the shaft.

3. A spring making machine comprising:

a cling device having a shaft and a first servo motor connected to the shaft, the servo motor having a rotor which is fixed to the shaft so that the shaft is driven by the first servo motor;

a feeding device having a third servo motor and a first gear connected to the shaft and engaged with a second gear, the second gear connected to a trans-roller unit and the a toothed belt connected between the first gear and a gear of the third servo motor.

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