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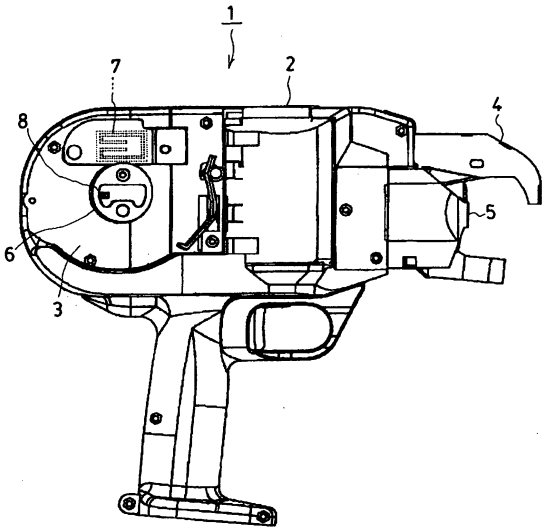
(54) REINFORCEMENT BINDER AND WIRE REEL

(57) An antenna of an RF tag reader and a photo sensor for detecting a rotational position of a wire reel are provided in a wire reel receiving portion of a reinforcing bar binding machine. The photo sensor detects a mark on the wire reel, and when an RF tag mounted on a side surface of the wire reel is brought into opposed relation to the antenna of the RF tag reader, a control portion decelerates or stops the wire reel, and an RF tag recognition operation by the RF tag reader is executed, thereby identifying a wire kind. When the RF tag is opposed to the antenna of the RF tag reader, the wire reel is decelerated or stopped, and in this condition the transmitting and receiving operations are executed, and therefore the stable communication can be executed.

FIG. 1



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Description

TECHNICAL FIELD

[0001] This invention relates to a reinforcing bar binding machine and a wire reel, and more particularly to a reinforcing bar binding machine and a wire reel, in which the kind of a wire wound on the wire reel is identified by a non-contact type sensor.

BACKGROUND ART

[0002] JP-A-08-114034 and JP-A-08-114035 disclose a motor-driven reinforcing bar binding machine provided with a binding wire feed mechanism for feeding a binding wire in a loop-shape so as to wind the binding wire around reinforcing bars, and a binding wire twisting mechanism for twisting the binding wire wound around the reinforcing bars so as to bind the reinforcing bars together, and executing one cycle of the binding operation including the binding wire feed operation and the binding wire twisting operation by operating a trigger.

[0003] JP-B2-3050369 discloses a reinforcing bar binding machine in which indication means indicative of a wire kind is provided on a wire reel, and means for detecting the wire kind indication means of the wire reel, as well as means for controlling a wire twisting torque according to the kind of the wire, is provided on the above reinforcing bar binding machine, and the kind of the wire is detected by the detection means, and the wire twisting torque is automatically set to a proper value by the control means according to the kind of the wire.

[0004] JP-B2-3050369 discloses, as means for reading information such as the kind of the wire, a construction for reading a reflection seal or bar code seal (affixed to the wire reel) by a reflection photo sensor, a construction for reading a magnet (embedded in the wire reel) by a magnetic sensor such as a Hall element or a reed switch, and a construction for detecting the wire kind by a lever-type switch in which a recess or a projection is formed at a side surface of the wire reel, and a distal end of a lever is resiliently contacted with the side surface of the wire reel, and follows the recess or the projection during rotation of the wire reel so that the lever-type switch can be turned on and off.

[0005] A reinforcing bar binding machine is mainly used outdoors at a construction site, and therefore is often exposed to wind, rain and sand, and mud and dirt are liable to deposit on its body. Therefore, when an optical element such as a photo sensor is used as the wire reel identification means, rain drops, mud and so on deposit on the optical element (provided on the body) and the reflection seal on the wire reel, so that the machine often can not be operated, or is subjected to a malfunction.

DISCLOSURE OF THE INVENTION

[0006] One or more embodiments of the present invention provide a reinforcing bar binding machine and a wire reel which have an identification performance of non-contact type wire reel identification means such as a stabilized RF recognition system.

[0007] According to one or more embodiments of the present invention, a reinforcing bar binding machine is provided with a wire feed mechanism, a wire twisting mechanism, and a wire cutting mechanism, a wire wound on a wire reel is fed in a loop-shape and wound around reinforcing bars, the wire loop is twisted to tighten the reinforcing bars, the wire loop is cut off from the wire extending from a trailing end of the wire loop so as to bind the reinforcing bars, and the machine is provided with means for reading wire identification information on the wire reel, control means for controlling a wire feed amount and a wire twisting torque based on the read wire identification information, an RF tag reader provided on a body of the reinforcing bar binding machine, an RF tag mounted on the wire reel, and control means for identifying a kind of the wire from a radio wave fed from the RF tag in response to a transmitting wave from the RF tag reader and for controlling the wire feed amount, the wire twisting torque, etc.

[0008] According to one or more embodiments of the present invention, the RF tag is mounted on a side surface of the wire reel, and the RF tag reader includes an antenna which is disposed so as to be opposed to an RF tag affixing surface of the wire reel loaded in the reinforcing bar binding machine.

[0009] According to one or more embodiments of the present invention, the reinforcing bar binding machine is provided with optical, magnetic or mechanical position detection means for detecting a rotational position of the wire reel, and transmit-receive timing control means for executing an RF tag recognition operation when the RF tag on the side surface of the wire reel is generally opposed to the antenna of the RF tag reader.

[0010] According to one or more embodiments of the present invention, the reinforcing bar binding machine is provided with wire feed control means or wire reel braking means for reducing the rotational speed of the wire reel when the RF tag on the side surface of the wire reel is generally opposed to the antenna of the RF tag reader.

[0011] According to one or more embodiments of the present invention, the reinforcing bar binding machine is provided with wire feed control means or wire reel braking means for stopping the RF tag on the side surface of the wire reel within a transmit-receive range of the RF tag reader.

[0012] According to one or more embodiments of the present invention, the reinforcing bar binding machine is provided with wire feed control means or wire reel braking means for stopping the wire reel when the RF tag on the side surface of the wire reel is generally opposed to the antenna of the RF tag reader.

[0013] According to one or more embodiments of the present invention, the wire reel braking means is provided with a recess portion provided on the wire reel, and a

braking member which is provided on the reinforcing bar binding machine so as to be brought into and out of engagement with the recess portion.

[0014] According to one or more embodiments of the present invention, the reinforcing bar binding machine executes the RF tag recognition step by the RF tag reader as part of an initialization operation which is executed when a power of the reinforcing bar binding machine is turned on, the initialization operation including the wire feed operation and so on.

[0015] According to one or more embodiments of the present invention, a wire reel is loaded in a reinforcing bar binding machine for binding reinforcing bars together, and a wire wound on the wire reel is fed in a loop-shape therefrom, and is wound around the reinforcing bars, and the wire loop is twisted to tighten the reinforcing bars, and the wire loop is cut off from the wire extending from a trailing end of the wire loop, and the wire reel includes an RF tag which is responsive to a transmitting wave from an RF tag reader, provided on the reinforcing bar binding machine, to feed a signal enabling a kind of the wire to be identified.

[0016] Other aspects and advantages of the invention will be apparent from the following description and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a side-elevational view showing a reinforcing bar binding machine, with a reel cover removed.
Fig. 2 is a circuit block diagram of the reinforcing bar binding machine.
Fig. 3(a) is a vertical cross-sectional view of a wire reel.
Fig. 3 (b) is a front-elevational view of the wire reel.
Fig. 4 is a rear view of the reinforcing bar binding machine.
Fig. 5 is a flow chart of an initialization operation of the reinforcing bar binding machine.
Fig. 6 is a front-elevational view showing another embodiment of a wire reel.
Fig. 7 is a side-elevational view showing another embodiment of a reinforcing bar binding machine, with a reel cover removed.
Fig. 8(a) is a vertical cross-sectional view of a wire reel.
Fig. 8 (b) is a front-elevational view of the wire reel.
Fig. 9 is a plan, cross-sectional view of the reinforcing bar binding machine.
Fig. 10 is a plan, cross-sectional view of the reinforcing bar binding machine.
Fig. 11 is a plan, cross-sectional view of the reinforcing bar binding machine.
Fig. 12 is a front-elevational view showing another embodiment of a wire reel.

DESCRIPTION OF THE REFERENCE NUMERALS

[0018]

1	reinforcing bar binding machine
3	wire reel receiving portion
6	reel support boss
7	loop antenna
8	reflection photo sensor
9	RF tag reader
10	control portion
21	reinforcing bar binding machine
22	round hole
23	solenoid
24	plunger
25	plate
26	micro switch
27	spring
31	wire reel
32	hub
33, 34	reel flange
36	RF tag
38	reflection mark
39	reflection mark
41	wire reel
42	hub
43, 44	reel flange
46	round hole
47	RF tag
48	slot

BEST MODE FOR CARRYING OUT THE INVENTION

[0019] One or more embodiments of the present invention will be described with reference to the drawings.

First Embodiment

[0020] Fig. 1 shows a right side surface of a reinforcing bar binding machine 1 according to an embodiment of the present invention. The reinforcing bar binding machine 1 is provided with a binding wire feed mechanism, a binding wire cutting mechanism, and a binding wire twisting mechanism. A wire reel is loaded into a wire reel receiving portion 3 formed in a right side surface of a housing 2 at a rear end portion thereof. The binding wire feed mechanism (not shown), is provided with a pair of gear-type pulleys in mesh with each other, is located forwardly of the wire reel receiving portion 3. A wire wound on the wire reel is fed forward by the binding wire feed mechanism, and is fed in a loop-shape along a curved wire guide nose 4 provided on a front end portion of the housing, and is wound around reinforcing bars. After a predetermined length of wire is fed out, and is wound around the reinforcing bars to form several turns therearound, the binding wire feed mechanism is stopped, and the wire loop is gripped by a hook (not shown) disposed at the inside of a hook cover 5 provided on a distal end

of the binding wire twisting mechanism, and a trailing end portion of the wire loop is cut by the binding wire cutting mechanism (not shown) located near to a proximal end portion of the wire guide nose 4, thereby cutting the wire loop off from the wire extending from the trailing end of the wire loop. Subsequently, the hook is driven to be rotated to twist a portion of the wire hoop, thereby binding the reinforcing bars together.

[0021] A reel support boss 6 of a circular shape is provided on the center of the wire reel receiving portion 3, and an RF tag reader (Radio Frequency tag reader) and a flat sheet-like loop antenna 7 are provided on a reverse surface of the wire reel receiving portion 3, and are disposed above the reel support boss 6. A reflection photo sensor 8, including a light emitting portion and a light receiving portion which are integral with each other, is provided on a front surface of the reel support boss 6, and the loop antenna 7 and the reflection photo sensor 8 are angularly spaced substantially 90 degrees form each other around the center of the reel support boss 6.

[0022] Fig. 2 is a block diagram showing the construction of a circuit of the reinforcing bar binding machine 1, and the RF tag reader 9 (RF transceiver) and the photo sensor 8 are connected to a control portion 10. When executing an initialization operation (for feeding the wire to the wire guide nose 4 and for cutting off its leading end portion by the binding wire cutting mechanism) upon turning-on of a main power, the control portion 10 is responsive to the rotational position of the wire reel (described later) (read by the photo sensor 8) and information of an RF tag of the wire reel (read by the RF tag reader 9) to automatically set the feed amount, the twisting torque and so on according to the kind of the wire. When a trigger signal is fed from a trigger switch 11 to the control portion 10, the control portion controls a wire feed motor drive circuit 12 and a wire twisting motor drive circuit 14 based on the automatically-set feed amount, twisting torque, etc., thereby sequentially driving a wire feed motor 13 and a wire twisting motor 15, thus executing one cycle of reinforcement binding operation.

[0023] Figs. 3(a) and 3(b) show the wire reel 31 which is a resin-molded product, and has reel flanges 33 and 34 integrally formed respectively on opposite sides of a cylindrical tubular hub 32. An RF tag mounting seat 35 of a rectangular shape is formed at an outer surface of one reel flange 33, and the wire reel is loaded into the reinforcing bar binding machine 1 in such a manner that the sheet-like RF tag 36, bonded to the RF tag mounting seat 35, faces the loop antenna 7 of the reinforcing binding machine 1. A reflection mark 38 of a white color is provided on a pin support post 37 formed within the hub 32. The positional relation between the RF tag 36 and the reflection mark 38 corresponds to the positional relation between the loop antenna 7 and the reflection photo sensor 8, and when the reflection mark 38 is brought into opposed relation to the reflection photo sensor 8 during the rotation of the wire reel 31, the RF tag 36 is opposed to the loop antenna 7. Fig. 4 shows a condition in which the wire reel 31 is loaded in the reinforcing bar binding machine 1. Reference numeral 9 denotes the RF tag reader.

[0024] One example of the RF tag 36 is a read-only RF tag (disclosed in JP-U-05-75890 and others) in which an aluminum foil coil pattern and a capacitor pattern are formed respectively on opposite sides of a dielectric film, and the coil pattern and the capacitor pattern are connected together to form an RF resonance circuit. In another example, an IC chip such as an EEP-ROM is mounted on the above RF tag so as to enable the reading and writing of data (disclosed in JP-A-2000-148950 and others). Either type may be used, but if merely the kind of the wire is to be identified, the use of the RF tag with no IC chip is satisfactory, and in this case the cost can be reduced. In the case of the RF tag having the IC chip mounted thereon, various data such as manufacturer's data and a manufacturing lot number other than the wire identification data can be written in the RF tag, and besides if necessary, the reinforcing bar binding machine can be constructed such that the amount of the remaining wire, a use-starting date of the wire and so on can be written in the RF tag through the RF transceiver of the reinforcing bar binding machine.

[0025] Here, the system, provided with the read-only RF tag and the RF tag reader, will be described. The RF tag reader 9, mounted on the reinforcing bar binding machine, includes a transmitting portion, a receiving portion, and a transmit-receive control portion. The transmitting portion of the RF tag reader 9 executes scanning while gradually varying a frequency of a transmitting wave at a predetermined frequency band, and when this transmitting portion transmits the radio wave having the same frequency as a resonance frequency of the RF tag 36, the resonance circuit of the RF tag 36 resonates with the transmitted wave, so that electric power is induced, and the RF tag sends a radio wave having the same frequency as that of the transmitted wave from the RF tag reader 9. The receiving portion of the RF tag reader 9 receives the radio wave sent from the resonance circuit of the RF tag 36, and the transmit-receive control portion recognizes the resonance frequency inherent to the RF tag from the frequency of the received wave, so that the frequency channel of the RF tag 36 is identified.

[0026] For example, in a frequency band "a" from the frequency channel a1 to a frequency channel a20, RF tags of different frequency channels a1, a8 and a15 are affixed respectively to three kinds of wire reels A, B and C having three different kinds of wires respectively wound thereon. In this case, the kind of the wire can be identified by determining whether the resonance frequency of the RF tag 36, received by the RF tag reader 9, is the frequency channel a1, the frequency channel a8 or the frequency channel a15. When there is no response to the transmitted wave, it can be judged that the wire and the wire reel are not genuine products.

[0027] A flow chart for the wire reel identification operation in the reinforcing bar binding machine is shown

in Fig. 5. First, when the wire reel 31 is loaded into the reinforcing bar binding machine 1, and a main power switch is turned on, the reinforcing bar binding machine 1 executes the initialization operation in which a predetermined length of wire is fed until a distal end of this wire reaches the wire guide nose 4. At this time, the wire reel 31 rotates, and when the reflection mark 38 is brought into opposed relation to the front surface of the reflection photo sensor 8 while the RF tag 36 is brought into opposed relation to the front side of the loop antenna 7 of the RF tag reader 9, the reflection photo sensor 8 outputs an ON-signal, and when the control portion 10 (serving as the control means) receives the ON-signal, this control portion 10 drives the RF tag reader 9, thereby executing the RF tag recognition operation.

[0028] Here, the kind of the wire reel (that is, the kind of the wire) is identified by the frequency reflected from the RF tag 36, and the control portion 10 sets a twisting torque and a feed amount to respective proper values according to the kind of the wire, and stops the feeding of the wire, thus finishing the initialization step. Thereafter, each time the trigger switch is operated, the binding operation is carried out with the twisting torque and feed amount set in the initialization step until the main power switch is turned off. Thus, the RF recognition operation is executed when the RF tag provided on the wire reel 31 is brought into opposed relation to the front side of the loop antenna 7 of the RF tag reader 9, and with this construction the wire reel can be positively identified.

[0029] The control may be executed such that when the reflection photo sensor 8 detects the reflection mark 38 (that is, when the RF tag 36 of the wire reel 31 is brought into opposed relation to the loop antenna 7 of the tag reader 9), the feeding of the wire is decelerated or stopped so that the RF tag recognition operation can be carried out more positively. Furthermore, instead of the spot-type reflection mark 38 on the wire reel 31, there can be used a reflection mark 39 which extends in the rotating direction to increase the range of detection of the reflection mark, as shown in Fig. 6. Furthermore, there is no problem if the RF tag recognition operation is continued during the binding operation executed after the initialization step is finished.

Second Embodiment

[0030] The first embodiment is directed to the construction in which the rotational position of the wire reel is detected by the photo sensor. Description will now be made of an embodiment in which a wire reel is temporarily stopped mechanically, and in this condition an RF recognition operation is executed so that the possibility of a recognition error can be further reduced.

[0031] Fig. 7 shows a reinforcing bar binding machine 21, and the arrangement of a loop antenna 7 and an RF tag reader is the same as in the reinforcing bar binding machine of Fig. 1. However, here, instead of using the photo sensor, a round hole 22 is formed through that portion of a wall of a wire reel receiving portion 3 disposed rearwardly of a reel support boss 6, and a plunger of a solenoid, provided on a reverse surface of the wire reel receiving portion 3, projects through this round hole 22 beyond a front surface (i.e., forwardly beyond the sheet of Fig. 7) of the wire reel receiving portion 3 so as to stop the wire reel.

[0032] Figs. 8 (a) and 8(b) show the wire reel 41, and reference numeral 42 denotes a hub, reference numerals 43 and 44 denote reel flanges, respectively, and reference numeral 45 denotes an RF tag mounting seat. A round hole 46 is formed through the reel flange 43, and is angularly spaced 90 degrees from the RF tag mounting seat 45 around the axis of rotation of the reel flange 43. The positional relation between the RF tag mounting seat 45 (and hence an RF tag 47) and the round hole 46 is the same as the positional relation between the RF tag 36 and the reflection mark 38 in the wire reel 31 of Fig. 3. Also, the round hole 22 in the wire reel receiving portion 3 of the reinforcing bar binding machine 21 of Fig. 7 is so disposed as to correspond to the round hole 46 in the wire reel 41 of Figs. 8 (a) and 8(b).

[0033] As shown in Fig. 9, the plunger 24 of the solenoid 23, provided on the reverse surface of the wire reel receiving portion 3, is inserted in the round hole 22 in the wall of the wire reel receiving portion 3 as described above, and when the solenoid 23 is energized, the plunger 24 projects into the wire reel receiving portion 3. A plate 25 is mounted on a rear end of the plunger 24, and when the plunger 24 advances, and is fitted into the round hole 46 in the wire reel 41, the plate 25 presses a micro switch 26 disposed adjacent to the solenoid 23, and turns on this micro switch 26. Reference numeral 27 denotes a spring, and reference numeral 28 denotes a wire feed mechanism disposed forwardly of (upwardly of in Fig. 9) the wire reel 41.

[0034] Fig. 9 shows an initial condition of the reinforcing bar binding machine 21, and when a power is turned on after the wire reel 41 is loaded, an initialization step is started, so that a wire feed operation is started, and also the solenoid 23 is energized so as to drive the plunger 24 forward. As a result, the plunger 24 is resiliently contacted with the reel flange 43 of the wire reel 41 as shown in Fig. 10, and when the round hole 46 in the wire reel 41 is brought into alignment with the plunger 24 during the rotation of the wire reel 41, the plunger 24 is fitted into the round hole 46 as shown in Fig. 11, so that the wire reel 41 is stopped in a position where the RF tag 47 is opposed to the loop antenna 7 of the RF tag reader 9.

[0035] At this time, the micro switch 26 is turned on by the plate 25 of the solenoid 23, and a control portion is responsive to this ON-signal to start an RF tag recognition operation. When the identification of a wire kind is completed by reading a resonance frequency of the RF tag 47, the control portion sets a twisting torque and a feed amount to respective proper values according to the kind of the wire, and also stops the energization of the solenoid 23, so that the plunger 24 is retracted to its initial position

by the spring 27, and is disengaged from the round hole 46 of the wire reel 41, thus finishing the initialization step.

[0036] Thus, the rotation of the wire reel 41 is temporarily stopped in the position where the RF tag 47 of the wire reel 41 is opposed to the loop antenna 7 of the RF tag reader 9, and in this condition the RF recognition operation is executed, and by doing so, the wire kind can be positively identified.

[0037] As shown in Fig. 12, the round hole 46 in the wire reel 41 can be replaced by a slot 48 extending in the circumferential direction of the wire reel 41 as is the case with the reflection mark 39 of the wire reel 31 of Fig. 6. In this case, the plunger 24 can be easily fitted into the hole in the rotating wire reel 41, thereby positively stopping the wire reel, and besides the resiliently-contacting force of the plunger 24 can be reduced, so that a resistance to the rotation of the wire reel, as well as electric power to be consumed, can be reduced.

[0038] The present invention is not limited to the above embodiments, and various modifications can be made within the technical scope of this invention. For example, instead of the wire twisting torque, a wire twisting time can be set, or an overload stop current value for the motor for executing the twisting operation can be set. Furthermore, a character, a mark, a color or the like which enables the wire kind to be identified can be indicated on the surface of the RF tag so that the wire reel can beforehand be recognized visually. Naturally, this invention covers these modifications.

[0039] Although the present invention has been described in detail by way of the specific embodiments, it will be apparent to those skilled in the art that various changes and modifications can be added without departing from the spirits of the present invention.

[0040] The present Application is based on Japanese Patent Application (Japanese Patent Application No. 2004-181732) filed on June 18, 2004, the contents of which are incorporated herein as a reference.

INDUSTRIAL APPLICABILITY

[0041] In one or more embodiments of the present invention, the reinforcing bar binding machine is constructed such that the RF tag is provided on the wire reel, and the wire kind is read by the RF tag reader provided on the reinforcing bar binding machine so that the wire feed amount and the wire twisting torque can be controlled. Therefore, this machine is less affected by a weather condition such as rain and a stain such as mud than the conventional type in which information is read by a photo sensor, and therefore the wire information can be positively obtained. And besides, the rotation of the wire reel is decelerated or stopped when the RF tag is disposed within the transmit-receive range of the RF tag reader, and by doing so, an RF recognition error can be prevented.

Claims

1. A reinforcing bar binding machine including a wire feed mechanism, a wire twisting mechanism, and a wire cutting mechanism for feeding a wire wound on a wire reel in a loop-shape so as to wind the wire around reinforcing bars, twisting a wire loop so as to tighten the reinforcing bars, cutting off the wire loop from the wire extending from a trailing end of the wire loop, and binding the reinforcing bars, the reinforcing bar binding machine comprising:

   means for reading wire identification information provided on the wire reel;
   control means for controlling a wire feed amount and a wire twisting torque based on the read wire identification information;
   an RF tag reader provided on a body of the reinforcing bar binding machine;
   an RF tag mounted on the wire reel; and
   control means for identifying a kind of the wire from a radio wave fed from the RF tag in response to a transmitting wave from the RF tag reader and for controlling the wire feed amount, the wire twisting torque.

2. The reinforcing bar binding machine according to claim 1, wherein the RF tag is provided on a side surface of the wire reel; and
   the RF tag reader includes an antenna disposed on a position opposed to an RF tag affixing surface of the wire reel loaded in the reinforcing bar binding machine.

3. The reinforcing bar binding machine according to claim 2, further comprising:

   position detection means for detecting a rotational position of the wire reel; and
   transmit-receive timing control means for executing an RF tag recognition operation when the RF tag on the side surface of the wire reel is generally positioned in a position opposed to the antenna of the RF tag reader.

4. The reinforcing bar binding machine according to claim 3, further comprising:

   means for reducing a rotational speed of the wire reel when the RF tag on the side surface of the wire reel is generally positioned in the position opposed to the antenna of the RF tag reader.

5. The reinforcing bar binding machine according to claim 3, further comprising:

   means for stopping the RF tag on the side surface of the wire reel within a transmit-receive

range of the RF tag reader.

6. The reinforcing bar binding machine according to claim 5, wherein the means for stopping the RF tag on the side surface of the wire reel within the transmit-receive range of the RF tag reader comprises
a recess portion provided on the wire reel, and
a braking member provided on the reinforcing bar binding machine and being brought into and out of engagement with the recess portion.

7. The reinforcing bar binding machine according to claim 3, further comprising:

means for stopping the wire reel when the RF tag on the side surface of the wire reel is generally positioned in the position opposed to the antenna of the RF tag reader.

8. The reinforcing bar binding machine according to claim 7, wherein the means for stopping the wire reel comprises
a recess portion provided on the wire reel, and
a braking member provided on the reinforcing bar binding machine and being brought into and out of engagement with the recess portion.

9. The reinforcing bar binding machine according to any one of claims 1 to 8, wherein a RF tag recognition step by the RF tag reader is executed as part of an initialization operation executed when a power of the reinforcing bar binding machine is turned on, the initialization operation including the wire feed operation.

10. A wire reel for being loaded in a reinforcing bar binding machine for feeding a wound wire in a loop-shape so as to wind the wire around reinforcing bars, twisting a wire loop so as to tighten the reinforcing bars, cutting off the wire loop from the wire extending from a trailing end of the wire loop, and binding the reinforcing bars, the wire reel comprising:

an RF tag that is responsive to a transmitting wave from an RF tag reader provided on the reinforcing bar binding machine and feeds a signal for identifying a kind of the wire.

11. A reinforcing bar binding machine comprising:

a wire reel receiving portion;
an RF tag reader; and
a loop antenna connected to the RF tag reader and disposed within the wire reel receiving portion.

12. The reinforcing bar binding machine according to claim 11, further comprising:

a reflection photo sensor disposed within the wire reel receiving portion and including a light-emitting portion and a light-receiving portion.

13. The reinforcing bar binding machine according to claim 12, further comprising:

a reel support boss provided within the wire reel receiving portion;

wherein the loop antenna and the reflection photo sensor are angularly spaced substantially 90 degrees from each other around a center of the reel support boss.

14. The reinforcing bar binding machine according to claim 11, further including:

a round hole formed in a wall of the wire reel receiving portion; and
a solenoid provided on a reverse surface of the wire reel receiving portion;

wherein a plunger of the solenoid can project through the round hole beyond a front surface of the wire reel receiving portion.

15. The reinforcing bar binding machine according to claim 14, further comprising:

a reel support boss provided within the wire reel receiving portion;

wherein the loop antenna and the round hole are angularly spaced substantially 90 degrees from each other around a center of the reel support boss.

16. A control circuit for a reinforcing bar binding machine comprising:

an RF tag reader;
a trigger switch;
a wire feed motor drive circuit;
a wire twisting motor drive circuit; and
a control portion.

17. The control circuit according to claim 16, when a trigger signal from the trigger switch is inputted to the control circuit, the control circuit controls the wire feed motor drive circuit and the wire twisting motor drive circuit based on wire identification data read by the RF tag reader and drives a wire feed motor and a wire twisting motor.

18. A wire reel comprising:

a cylindrical tubular hub;
a reel flange; and

an RF tag mounted on the reel flange.

19. The wire reel according to claim 18, further comprising:

an RF tag mounting seat formed at an outer surface of the reel flange;

wherein the RF tag is bonded to the RF tag mounting seat.

20. The wire reel according to claim 18, wherein wire identification data is stored in the RF tag.

21. The wire reel according to claim 20, wherein manufacturer's data and a manufacturing lot number are further stored in the RF tag.

22. The wire reel according to claim 20, wherein an amount of the remaining wire and a use-starting date of the wire can be written in the RF tag.

23. The wire reel according to claim 18, further comprising:

a reflection mark.

24. The wire reel according to claim 23, wherein the RF tag and the reflection mark are angularly spaced substantially 90 degrees from each other around an axis of rotation of the wire reel.

25. The wire reel according to claim 18, further comprising a round hole formed in the reel flange.

26. The wire reel according to claim 25, wherein the RF tag and the round hole in the reel flange are angularly spaced substantially 90 degrees from each other around an axis of rotation of the wire reel.

27. A wire wound around the wire reel as defined in claim 18.

28. A method of binding reinforcing bars by a reinforcing bar binding machine, comprising the steps of:

feeding a wire until a distal end of the wire reaches a wire guide nose;
driving an RF tag reader;
identifying a kind of the wire from a frequency reflected from an RF tag mounted on a wire reel; and
setting a twisting torque and a feed amount based on the kind of the wire.

29. The method of binding reinforcing bars by a reinforcing bar binding machine according to claim 28, further comprising the steps of:

detecting a reflection mark on the wire reel; and
driving the RF tag reader when the reflection mark is detected.

30. The method of binding reinforcing bars by a reinforcing bar binding machine according to claim 29, further comprising the step of:

reducing a speed of feeding of the wire when the reflection mark is detected.

31. The method of binding reinforcing bars by a reinforcing bar binding machine according to claim 29, further comprising the step of:

stopping the feeding of the wire when the reflection mark is detected.

32. The method of binding reinforcing bars by a reinforcing bar binding machine according to claim 28, further comprising the steps of:

driving a plunger in a forward direction; and
driving the RF tag reader when the plunger is fitted into a round hole in the wire reel.

33. The method of binding reinforcing bars by a reinforcing bar binding machine according to claim 32, further comprising the step of:

stopping the feeding of the wire when the plunger is fitted into the round hole in the wire reel.

34. A method of identifying a kind of a wire in a reinforcing bar binding machine, comprising the steps of:

transmitting a radio wave by a transmitting portion of an RF tag reader provided on the reinforcing bar binding machine while gradually varying a frequency of the radio wave;
inducing electric power by a resonance circuit of an RF tag when the frequency of the transmitted wave corresponds to a resonance frequency of the RF tag mounted on a wire reel;
sending a radio wave by the RF tag;
receiving the wave from the RF tag by a receiving portion of the RF tag reader;
recognizing the resonance frequency of the RF tag by a transmit-receive control portion of the RF tag reader; and
identifying the kind of the wire from the resonance frequency of the RF tag.

35. The method of identifying a kind of a wire in a reinforcing bar binding machine according to claim 34, when the RF tag makes no response to the wave transmitted from the transmitting portion of the RF tag reader, it is judged that the wire and the wire reel

are not genuine products.

FIG. 1

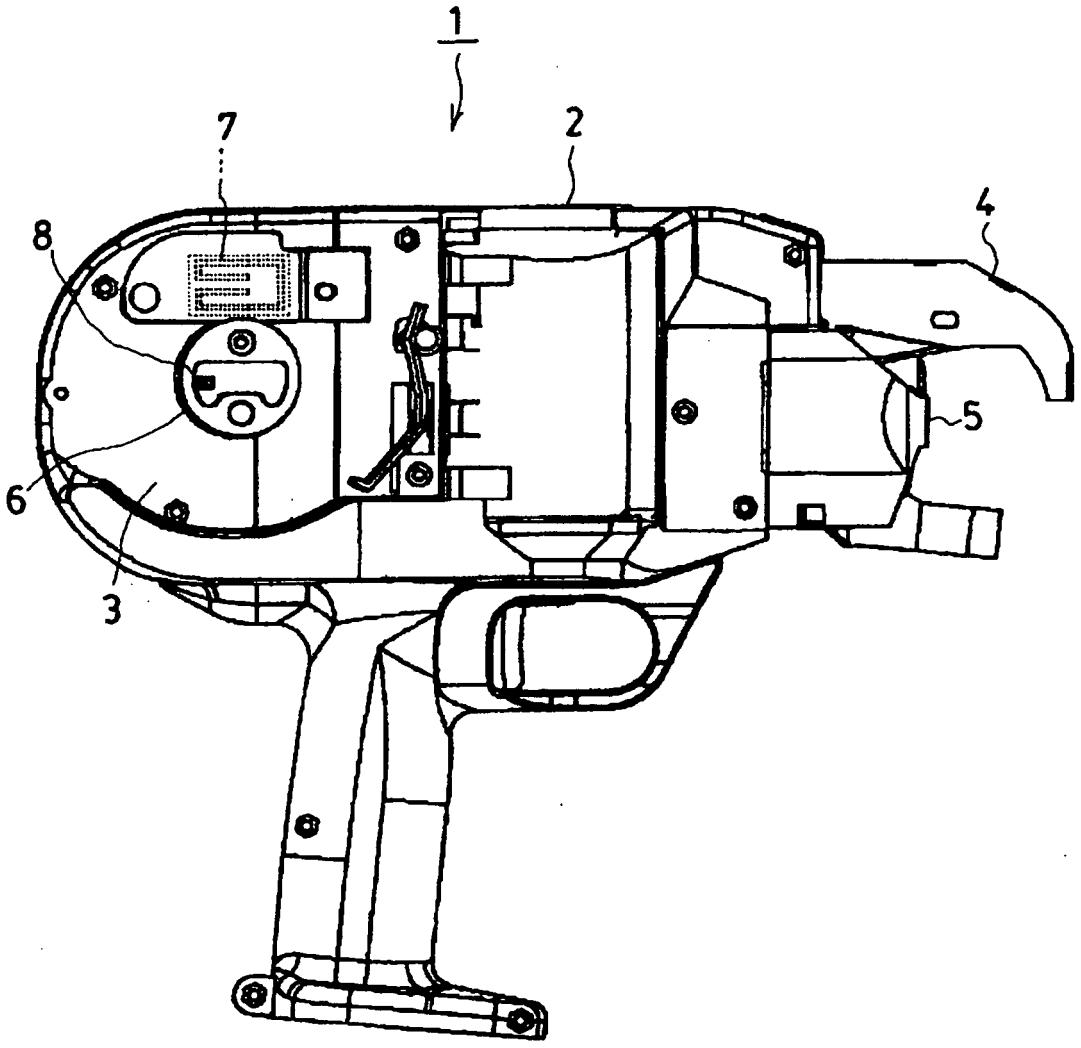


FIG.2

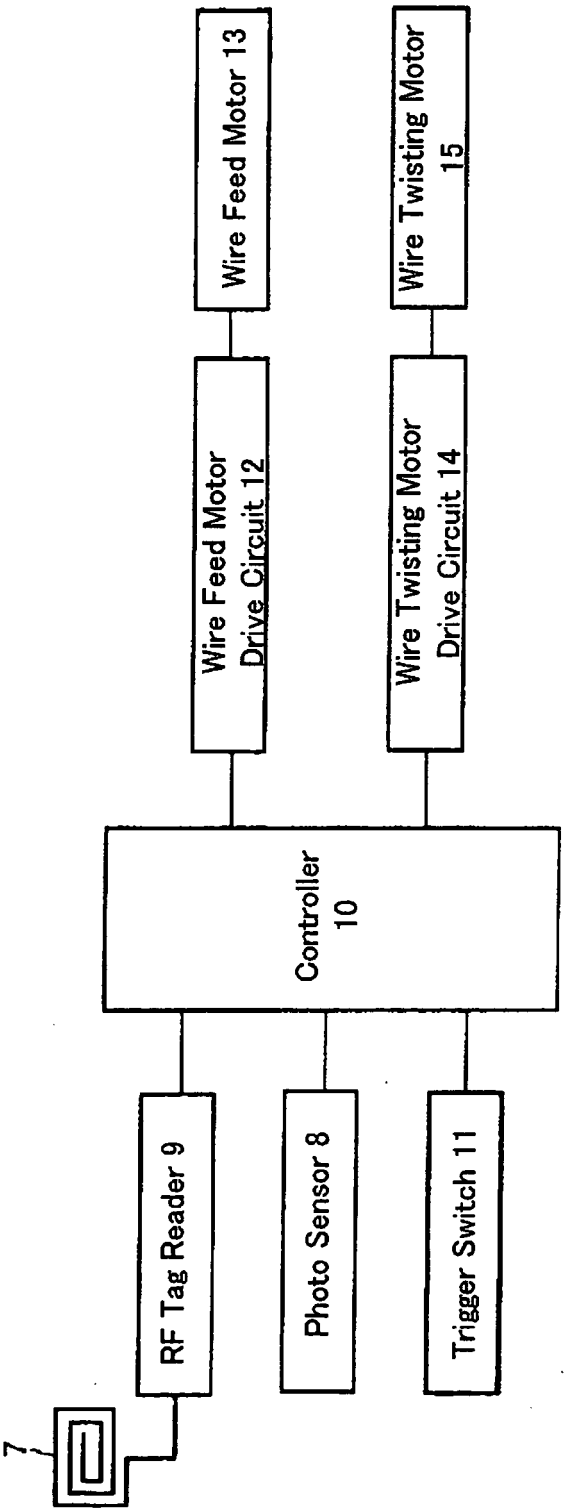

Wire Feed Motor 13
Wire Twisting Motor 15
Wire Feed Motor Drive Circuit 12
Wire Twisting Motor Drive Circuit 14
Controller 10
RF Tag Reader 9
Photo Sensor 8
Trigger Switch 11
7

FIG.3(a)

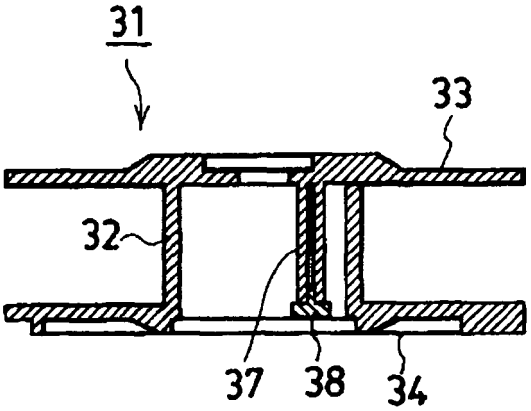


FIG.3(b)

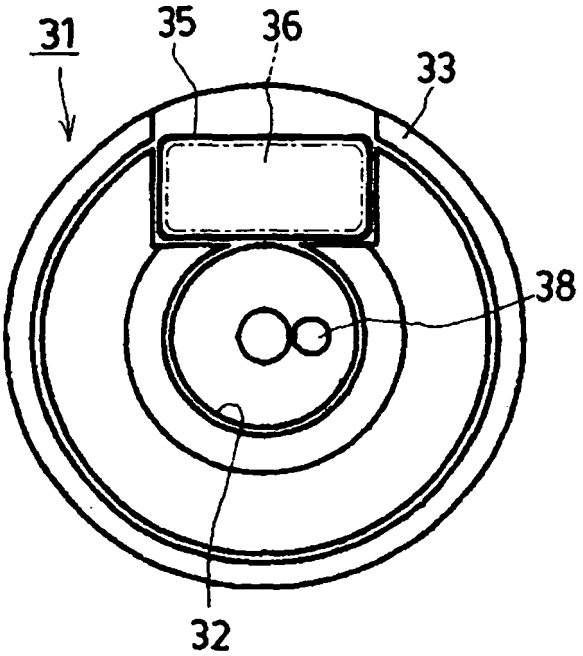


FIG.4

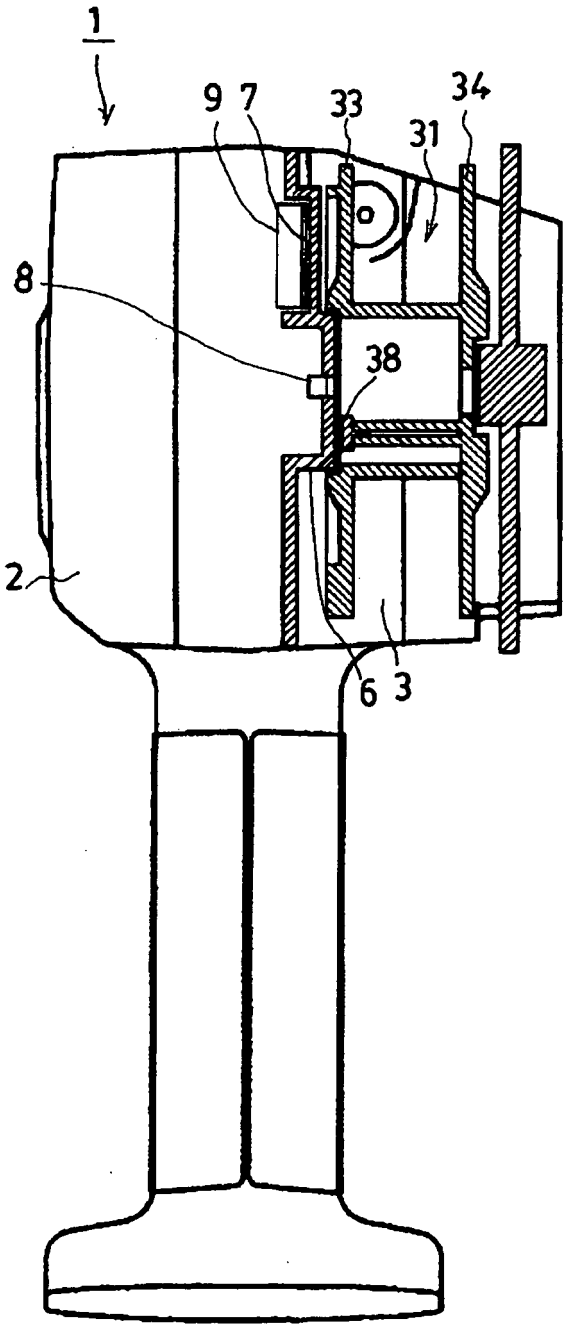


FIG.5

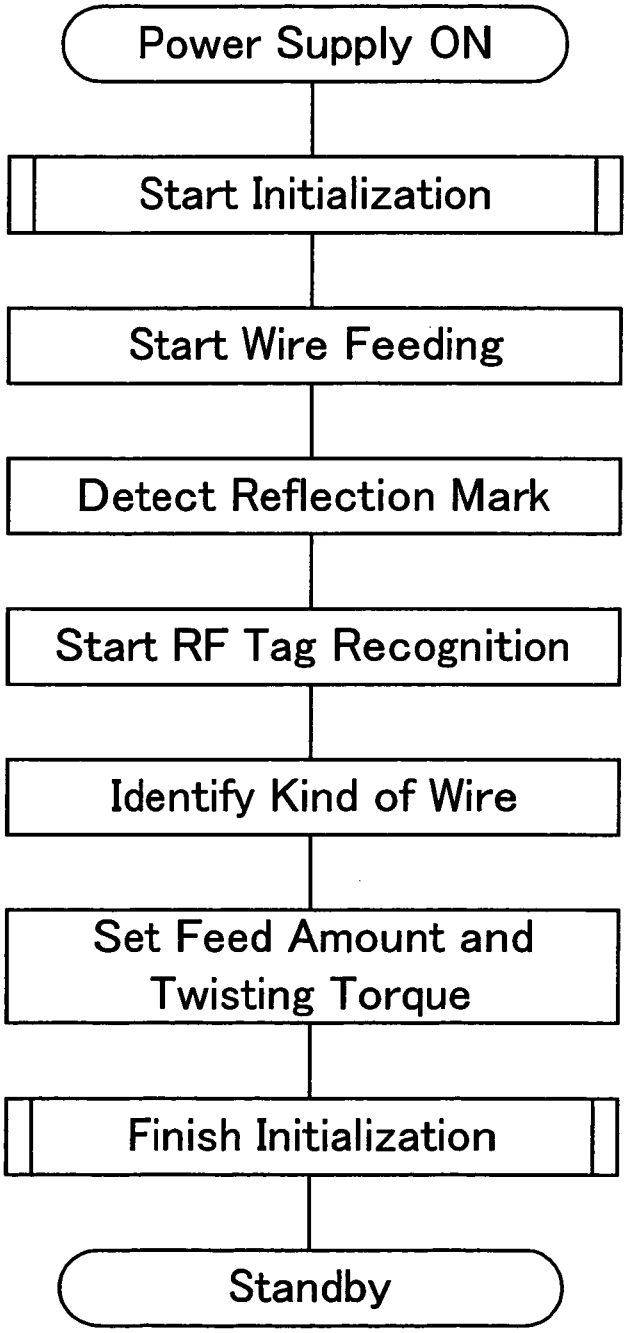

Power Supply ON
Start Initialization
Start Wire Feeding
Detect Reflection Mark
Start RF Tag Recognition
Identify Kind of Wire
Set Feed Amount and Twisting Torque
Finish Initialization
Standby

FIG.6

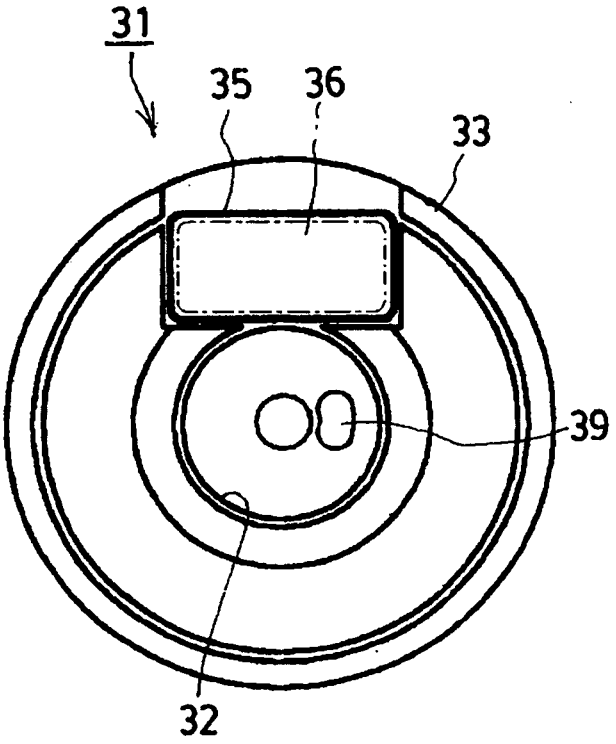


FIG. 7

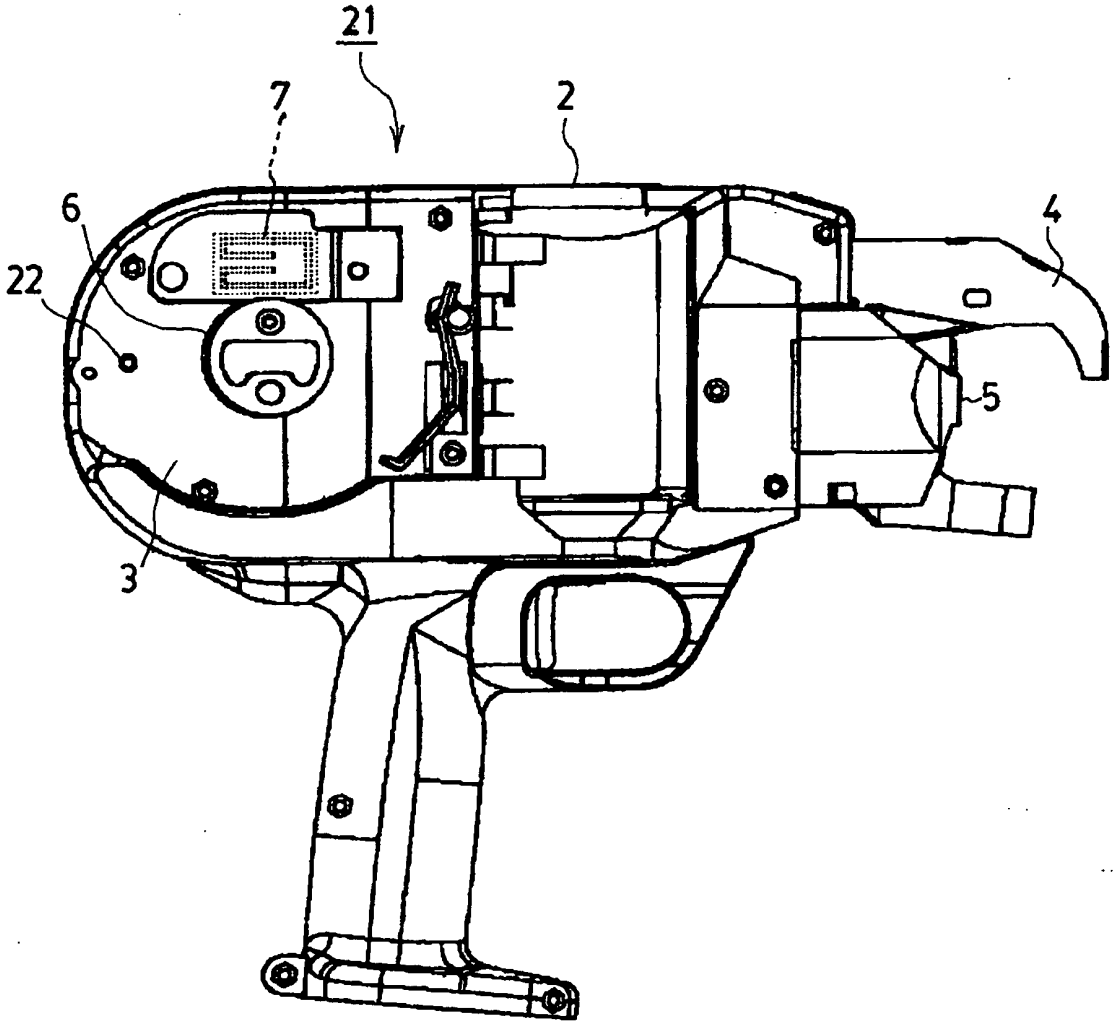


FIG.8(a)

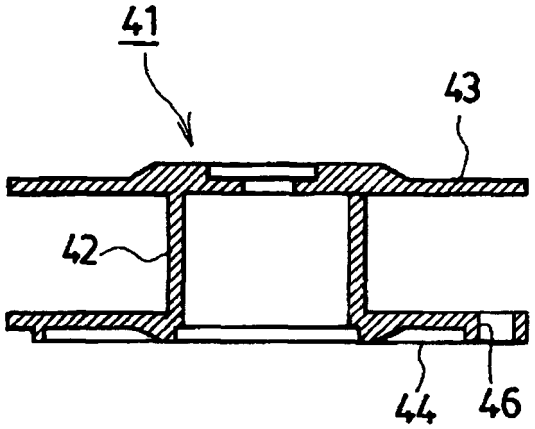


FIG.8(b)

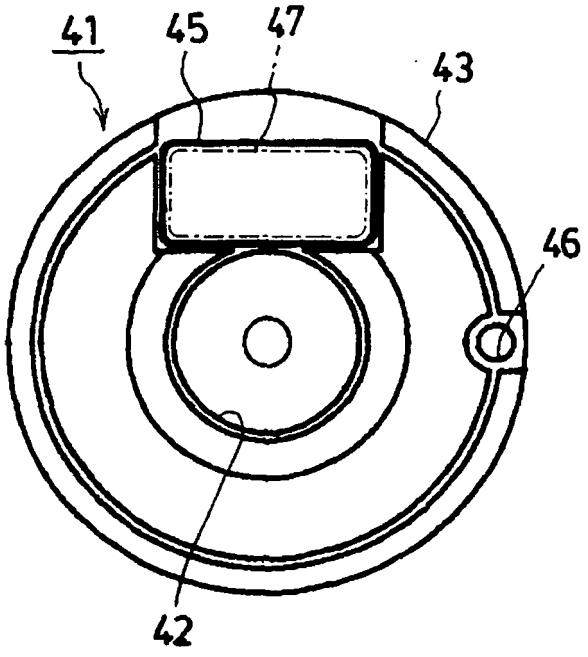


FIG.9

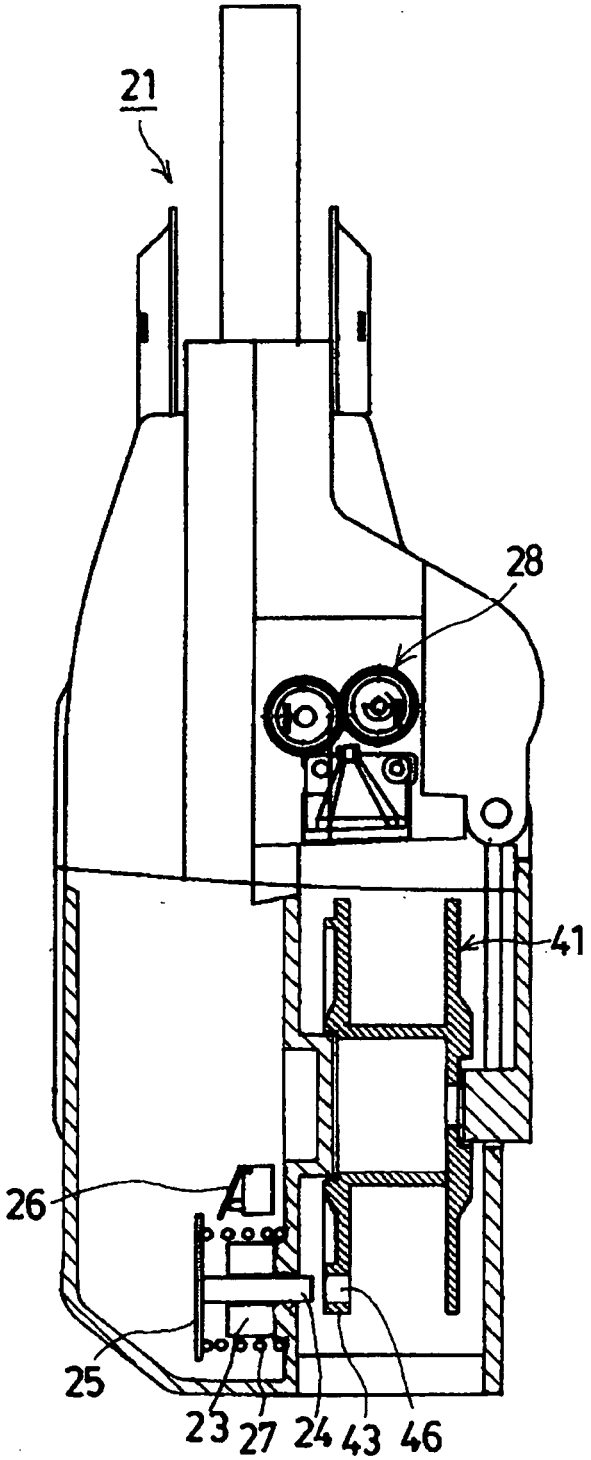


FIG. 10

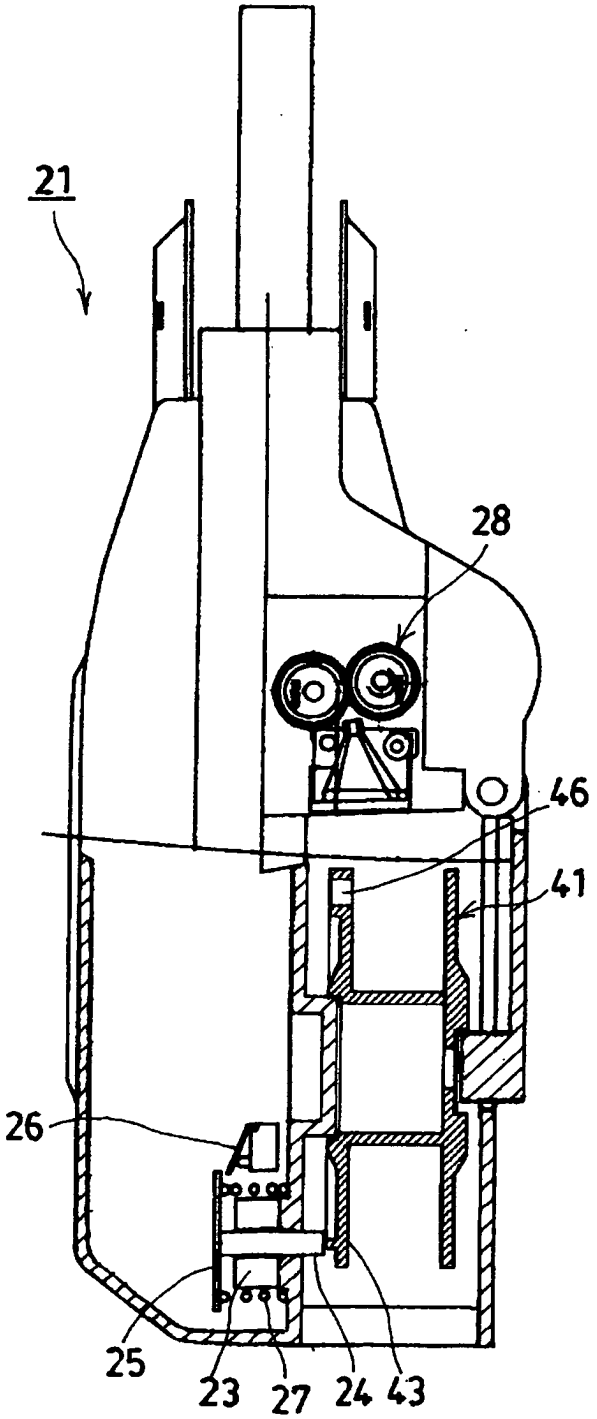


FIG. 11

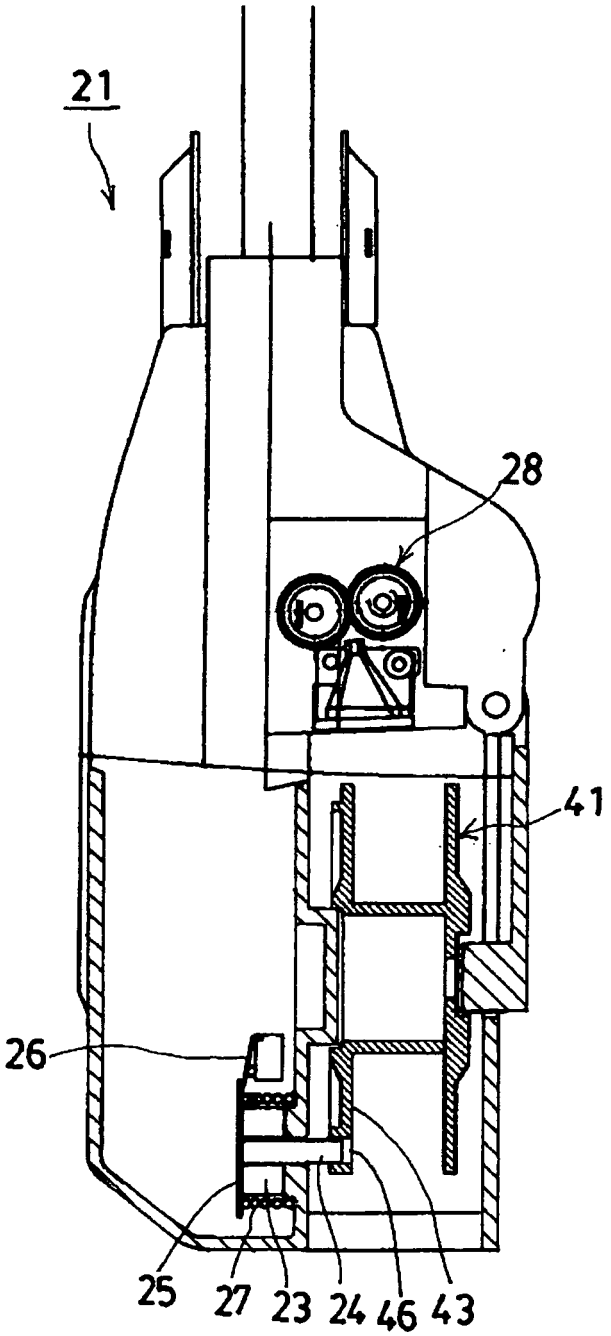
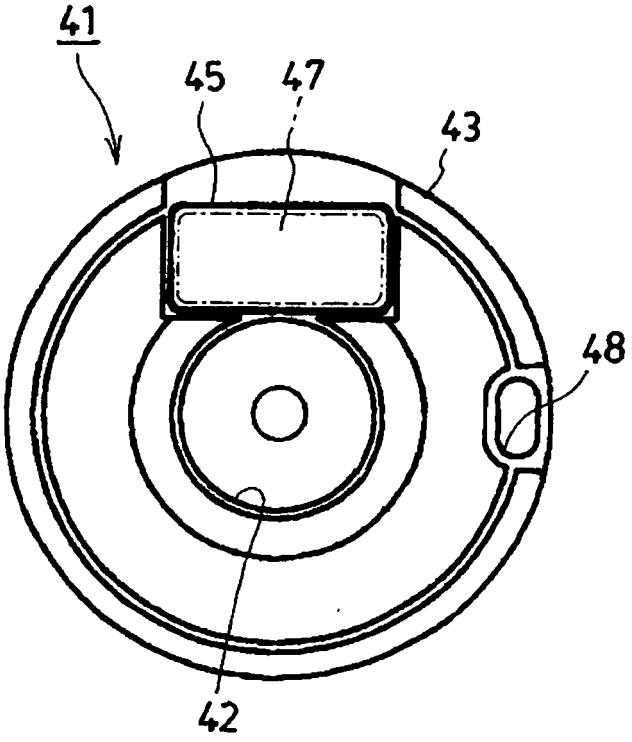


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/009371

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] E04G21/12, B65B13/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] E04G21/12, B65B13/18, E04G21/16, B25B25/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 09-165918 A (Max Co., Ltd.), 24 June, 1997 (24.06.97), Full text; all drawings & US 5678613 A & EP 0751270 A1	1-2,9-12,16, 18-23,27 3-8,13-15, 17,24-26, 28-35
Y A	JP 2003-326741 A (Konica Minolta Holdings Kabushiki Kaisha), 19 November, 2003 (19.11.19), Full text; all drawings (Family: none)	1-2,9-12,16, 18-23,27 3-8,13-15, 17,24-26, 28-35
Y A	JP 2557192 Y2 (Max Co., Ltd.), 08 December, 1997 (08.12.97), Full text; all drawings (Family: none)	12,23 1-11,13-22, 24-35

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
07 June, 2005 (07.06.05)	21 June, 2005 (21.06.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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Patent documents cited in the description

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- JP 8114035 A **[0002]**
- JP 3050369 B **[0003] [0004]**
- JP 5075890 U **[0024]**
- JP 2000148950 A **[0024]**
- JP 2004181732 A **[0040]**