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**Kim**

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(54) **PAPER FEEDING APPARATUS**

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**B65H 7/02** (2006.01)

(52) **U.S. Cl.**

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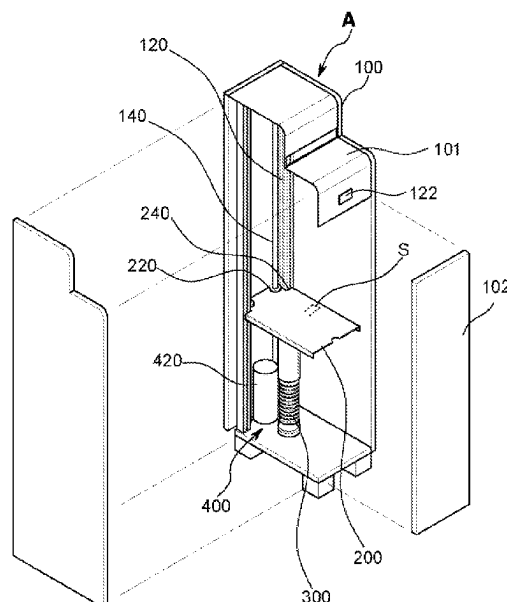
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(57) **ABSTRACT**

The present invention relates to a paper feeding apparatus. The paper feeding apparatus includes: a main body configured such that a paper discharge outlet, a space, and a door are formed therein; a plurality of guide rails formed inside the main body in vertical directions; a plurality of guide rods formed inside the main body in vertical directions; a paper support plate formed in a plate shape so that paper is stacked and supported thereon, and configured such that a plurality of bushings, insertion grooves, and a multi-stage screw are formed in connection with the paper support plate; a power unit including a motor provided with a driving pulley, a driven pulley, and a chain configured to connect the driving pulley and the driven pulley; and a sensor configured to measure the weight of paper, and a controller configured to control the driving of the power unit.

**2 Claims, 5 Drawing Sheets**



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FIG. 1

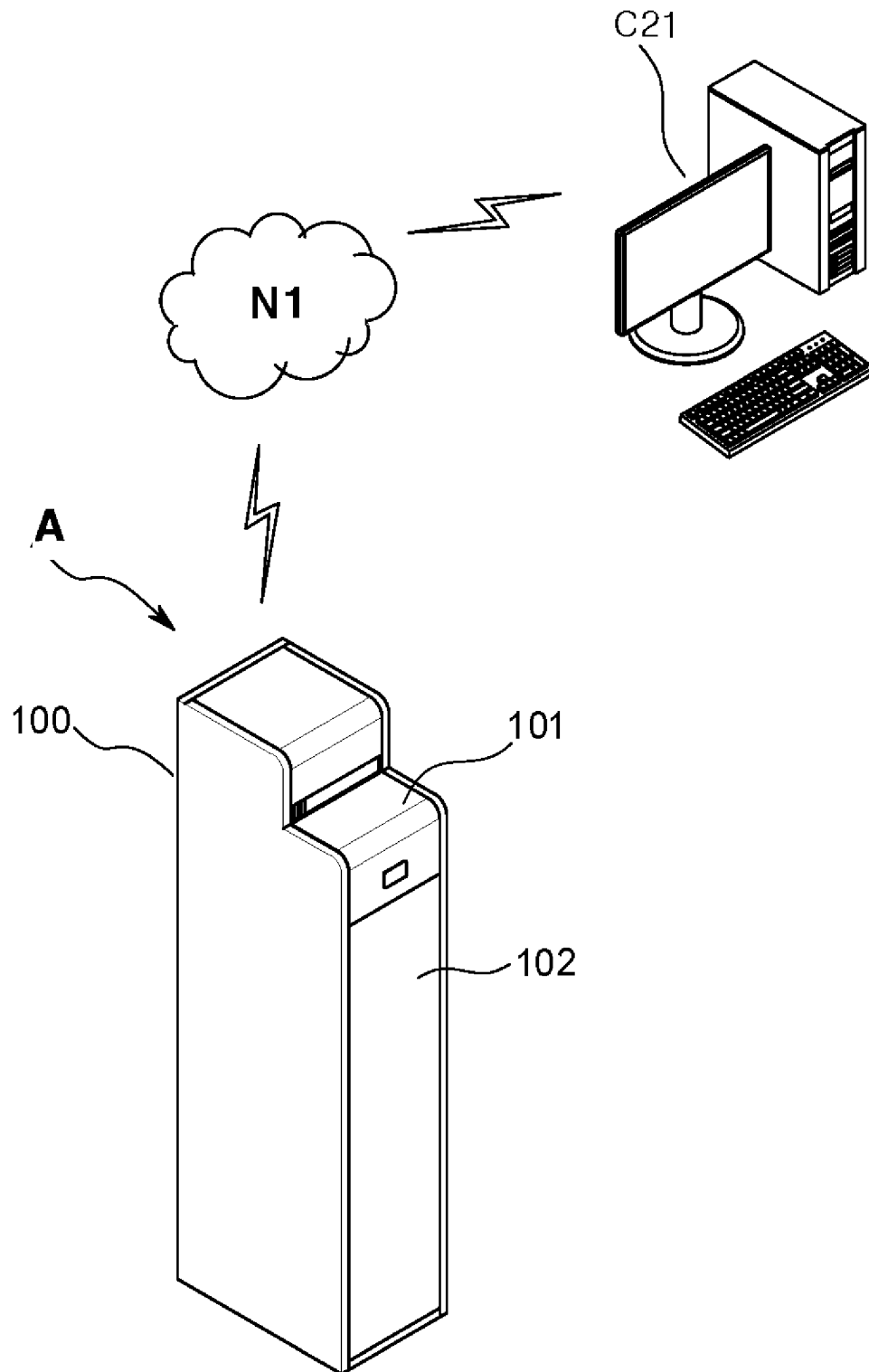


FIG. 2

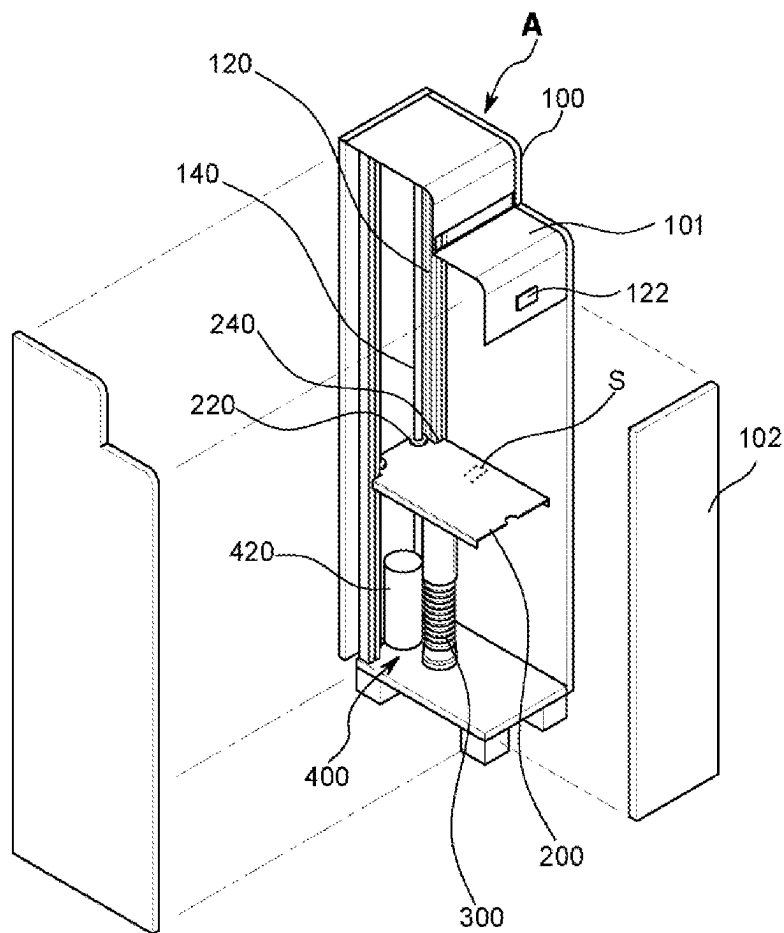


FIG.3

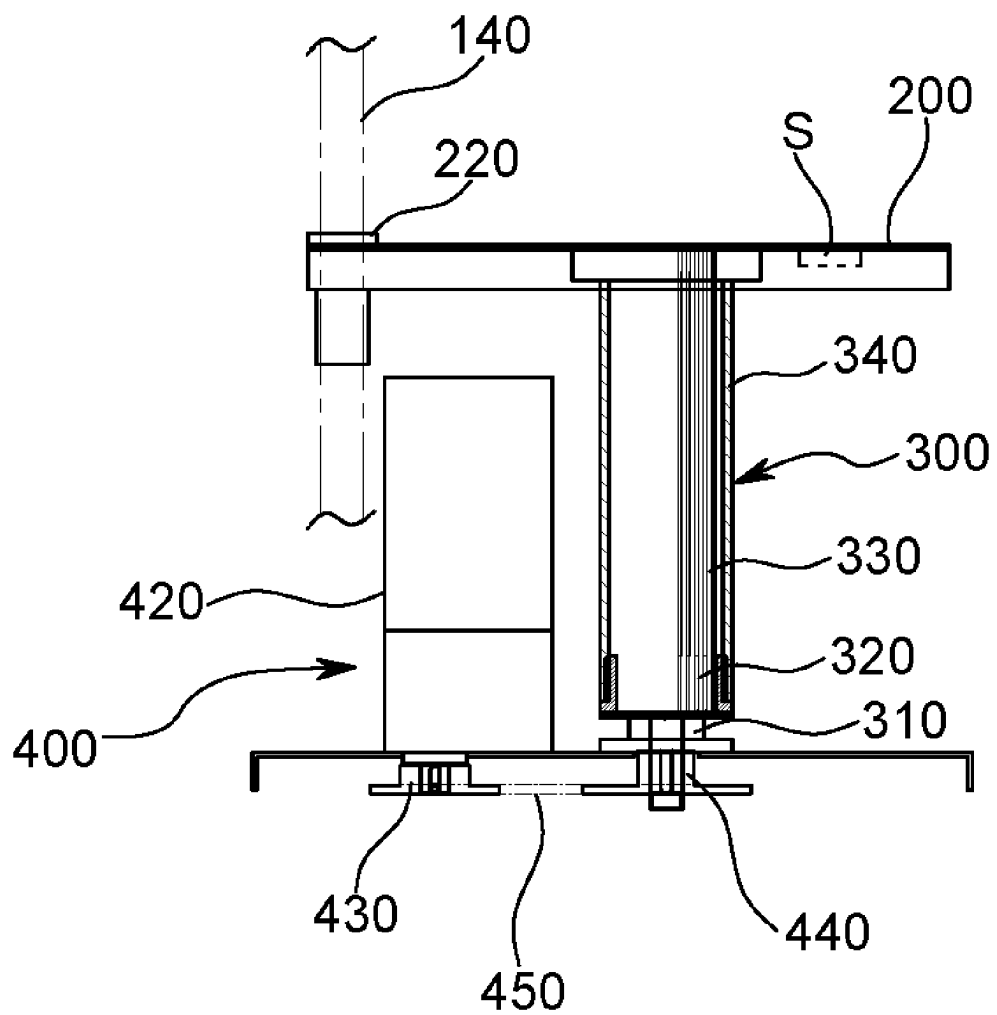


FIG. 4A

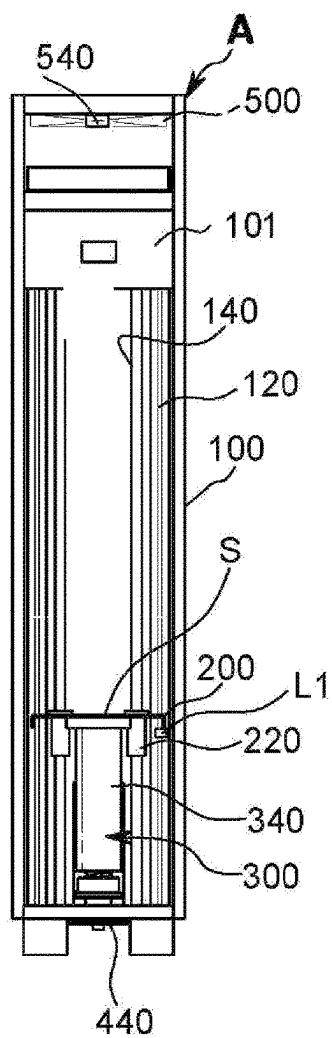


FIG. 4B

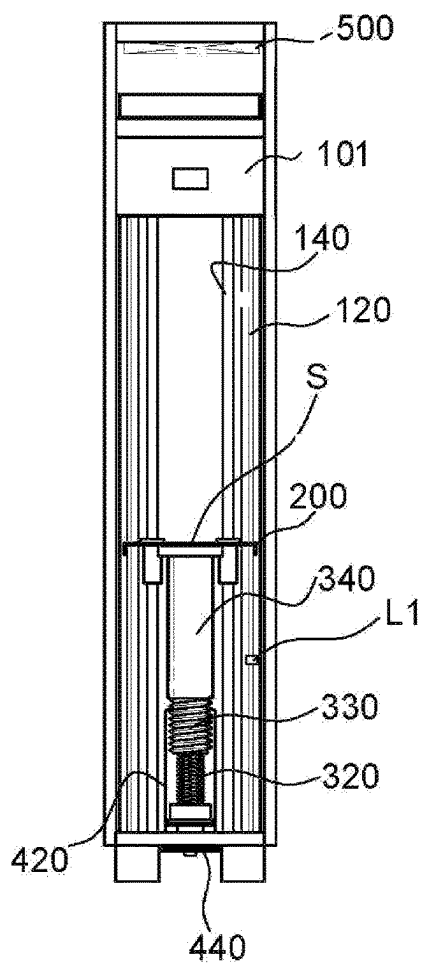


FIG. 4C

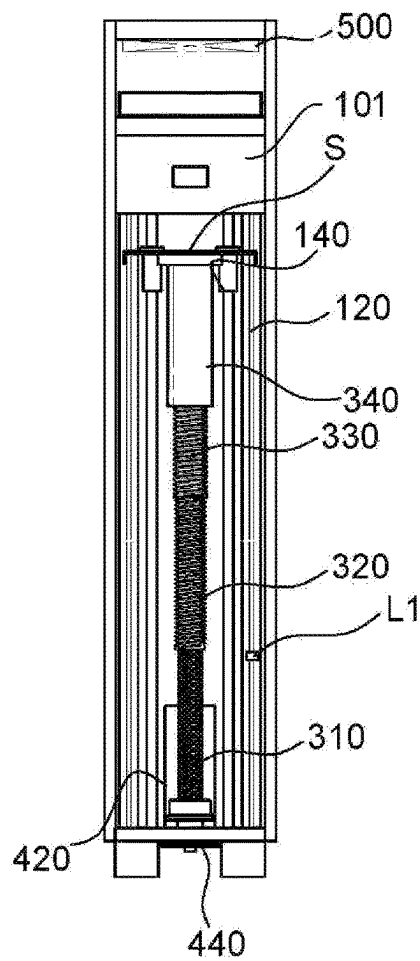
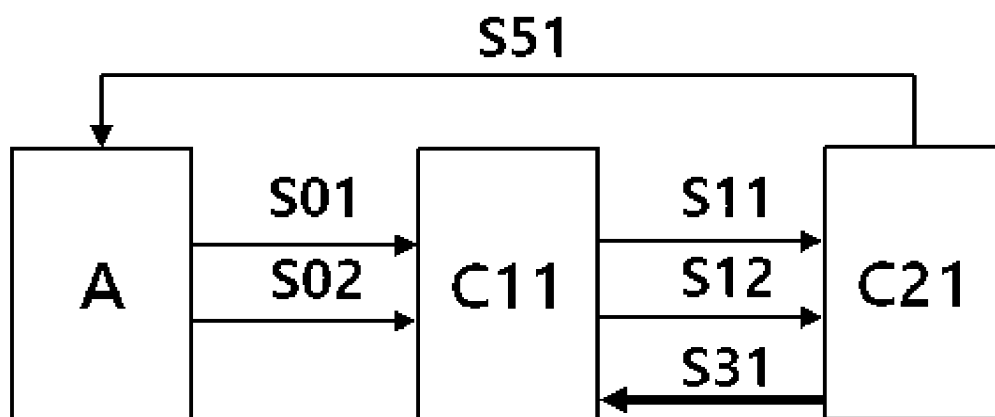


FIG. 5



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**PAPER FEEDING APPARATUS****TECHNICAL FIELD**

The present invention relates to a paper feeding apparatus, and more particularly, to a paper feeding apparatus that, in a state in which a large amount of paper is stacked, automatically senses a paper shortage state and then informs an external paper supplier of the paper shortage state so that the paper supplier can replenish the paper feeding apparatus with paper without a need for a user to separately determine the amount of remaining paper.

**BACKGROUND ART**

Paper for offices (e.g., A4 paper) widely used in companies or government offices is packaged in units of hundreds of sheets, and the paper packaged in small size as described above is boxed again in bundle forms and fed to consumers. When using the packaged paper, the consumers dismantle the box packaging, peel off packaging paper, and then fill a printer, a copier, or an all-in-one printer with the paper.

When using paper, consumers generally do not keep track of the amount of remaining paper after purchasing paper on a per-box package or small-sized package basis. Accordingly, when a printer, a copier, or an all-in-one printer runs out of paper, the consumers first look for small-packaged or box-packaged paper to fill paper. If there is no paper or there is not sufficient paper left at that time, consumers will purchase or order paper from an online or offline store. Users always purchase or order paper on a per-box basis in order to avoid a paper shortage.

Accordingly, there is a demand for a scheme capable of, in the feeding of paper for offices, reducing the above-described costs or waste of human and material resources attributable to the double packaging composed of small-sized packaging of hundreds of sheets using packaging paper and bundled box packaging and also reducing the above-described inconvenience in which consumers keep track of the amount of remaining paper and then order or purchase paper.

**DISCLOSURE****Technical Problem**

The present invention has been conceived to overcome the problems of the prior art, and an object of the present invention is to provide a convenient paper feeding apparatus that can reduce the costs and waste of resources attributable to conventional double packaging composed of small-sized unit packaging and box packaging in the feed of paper for offices and prevent a consumer from having to keep track of the amount of remaining paper.

**Technical Solution**

The above-described object of the present invention is accomplished by a paper feeding apparatus including: a main body configured such that a paper discharge outlet is formed in an upper portion of a front side thereof, a space is formed therein, and a door configured to be selectively opened and closed is formed in the front side thereof, a paper support plate formed in a plate shape so that paper is stacked and supported thereon; an elevation unit installed inside the main body, and configured to selectively elevate and lower the paper support plate; a power unit mounted in a lower part

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of the main body, and configured to move the paper support plate; a sensor configured to measure a weight of the paper stacked on the paper support plate; and a controller configured to control the driving of the power unit in conjunction with the sensor; wherein the controller, when the sensor detects a change in the weight of the stacked paper, elevates the paper support plate in association with a moving distance calculated according to a reduction in weight by driving the motor to extend the multi-stage screw.

The paper feeding apparatus further includes a communication unit integrated with or provided to correspond to the paper feeding apparatus and configured to transmit a paper replenishment request signal when the paper feeding apparatus senses a paper shortage state and transmit a paper replenishment completion signal when the paper feeding apparatus senses a paper replenishment completion state.

The multi-stage screw includes: a first-stage screw connected to a driven pulley, and provided with a thread that is formed on an outer circumferential surface thereof; a second-stage screw screwed to the first-stage screw, and provided with a thread that is formed on an outer circumferential surface thereof; a third-stage screw screwed to the second-stage screw, and provided with a thread that is formed on an outer circumferential surface thereof; and a screw housing screwed to an outside of the third-stage screw, and provided with a top end that is fixed to the paper support plate.

The controller further includes a height detection unit configured to detect whether the paper support plate reaches a desirably set remaining amount height; and the controller generates a paper shortage signal when the height detection unit detects a situation in which the paper support plate reaches the set remaining amount height. The controller transmits a paper shortage signal to the communication unit when the height detection unit detects a situation in which the paper support plate reaches the set remaining amount height.

The paper support plate is configured such that a plurality of bushings to be fitted around the guide rods are formed and insertion grooves into which the guide rails are coupled are formed therein.

The power unit includes a motor mounted in a lower part of the main body and provided with a driving pulley, a driven pulley formed at a lower end of the multi-stage screw, and a chain configured to connect the driving pulley and the driven pulley.

The controller further includes a height detection unit configured to detect whether the paper support plate reaches a set remaining amount height; and the controller stops the operation of the motor when the height detection unit detects a situation in which the paper support plate reaches the set remaining amount height.

The elevation unit includes: a plurality of guide rails formed inside the main body in a vertical direction; a plurality of guide rods formed inside the main body in a vertical direction, and arranged in parallel with the guide rails; and a multi-stage screw formed under the paper support plate.

**Advantageous Effects**

According to the present invention, there is provided a paper feeding apparatus of a new concept that can automatically determine the amount of remaining paper and feed paper, so that there can be provided the effects of reducing



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the costs and waste of resources attributable to conventional small-sized unit packaging and box packaging and providing convenience to consumers.

In addition, there is an effect of contributing to the prevention of environmental contamination because there is no need for separate manufacturing and waste disposal of small-sized unit packaging paper for the packaging of hundreds of sheets of paper and box packaging paper for box packaging.

#### DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view showing a paper feeding apparatus according to the present invention;

FIG. 2 is an exploded perspective view showing the paper feeding apparatus according to the present invention;

FIG. 3 is a view showing the 'power unit' of the paper feeding apparatus according to the present invention;

FIGS. 4A-4C are front views showing the elevation operation of the 'paper support plate' of the paper feeding apparatus according to the present invention; and

FIG. 5 is a view showing a paper feeding system according to an embodiment of the present invention.

#### MODE FOR INVENTION

The amount of remaining stacked paper for offices is automatically determined and then paper is fed, so that the convenience of a consumer can be improved in the management of paper for offices and the costs and waste of resources attributable to conventional small-sized unit packaging and box packaging can be reduced.

Embodiments will be described in detail below with reference to the accompanying drawings. However, since various modifications may be made to the embodiments, the scope of rights is not limited or restricted by these embodiments. It should be understood that all modifications, equivalents and substitutes to the embodiments are included within the scope of rights.

Specific structural or functional descriptions of the embodiments are disclosed for illustrative purposes only, and may be modified and implemented in various forms. Accordingly, the embodiments are not limited to specific disclosed forms, and the scope of the present specification includes modifications, equivalents, or substitutes included in the technical spirit.

Although terms such as first or second may be used to describe various components, such terms should only be construed for the purpose of distinguishing one component from another. For example, a first element may be termed a second element, and similarly, a second element may be termed a first element.

Among the accompanying drawings, FIG. 1 is a perspective view showing a paper feeding apparatus according to the present invention, FIG. 2 is an exploded perspective view showing the paper feeding apparatus according to the present invention, FIG. 3 is a view showing the 'power unit' of the paper feeding apparatus according to the present invention, FIGS. 4A-4C are front views showing the elevation operation of the 'paper support plate' of the paper feeding apparatus according to the present invention, and FIG. 5 is a view showing a paper feeding system according to an embodiment of the present invention.

As shown in FIGS. 1 to 5, a paper feeding apparatus A according to the present invention is configured to include: a main body 100 configured such that a paper discharge outlet 101 is formed in the upper portion of the front side

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thereof, a space is formed therein, and a door 102 configured to be selectively opened and closed is formed in the front side thereof,

a plurality of guide rails 120 formed inside the main body 100 in vertical directions;

a plurality of guide rods 140 formed inside the main body 100 in vertical directions, and arranged in parallel with the guide rails 120;

a paper support plate 200 formed in a plate shape so that paper is stacked and supported thereon, and configured such that a plurality of bushings 220 fitted around the guide rods 140 are formed, insertion grooves 240 into which the guide rails 120 are coupled are formed, and a multi-stage screw 300 is formed thereunder;

a power unit 400 including a motor 420 mounted in the lower part of the main body 100 and provided with a driving pulley 430, a driven pulley 440 formed at the lower end of the multi-stage screw 300, and a chain 450 configured to connect the driving pulley 430 and the driven pulley 440; and

a sensor S mounted on the paper support plate 200 and configured to measure the weight of paper, and a controller 500 connected to the sensor S and configured to control the driving of the power unit 400.

When the sensor S detects a change in the weight of the stacked paper, the controller 500 elevates the paper support plate 200 in association with the moving distance calculated according to the reduction in the weight by driving the motor 420 to extend the multi-stage screw 300. Accordingly, the paper support plate 200 selectively moves up and down while supporting the paper, so that a predetermined amount of paper is partially drawn out through the paper discharge outlet 101 when it is necessary to replenish a copier, a printer, and an all-in-one printer, and thus a user may conveniently remove and use paper.

The elevation unit includes: the plurality of guide rails 120 formed inside the main body 100 in a vertical direction; the plurality of guide rods 140 formed inside the main body 100 in a vertical direction and arranged in parallel with the guide rails 120; and the multi-stage screw 300 formed under the paper support plate 200 formed in a plate shape so that paper is stacked and supported thereon.

The main body 100 is formed in a rectangular parallelepiped shape having an internal space so that a large amount of paper can be stacked and stored in a vertical direction, and the paper discharge outlet 101 is formed in the upper portion of the front surface so that the user can open the paper discharge outlet 101 and take out the inner paper. Meanwhile, a locking device 122 may be additionally formed in the paper discharge outlet 101 so that the use of the paper can be managed.

The door 102 is hingedly coupled to the front of the main body 100 to be selectively opened and closed so that paper can be filled therein.

A heating device (not shown) configured to prevent moisture may be provided inside the main body 100. The heating device can prevent paper from being deformed due to moisture.

The power unit 400 is connected to the multi-stage screw 300, and causes the operation of selectively extending and reducing the length of the multi-stage screw 300.

The power unit 400 includes the motor 420 mounted in the lower part of the main body 100 and provided with the driving pulley 430, the driven pulley 440 formed at the lower end of the multi-stage screw 300, and the chain 450 configured to connect the driving pulley 430 and the driven pulley 440.

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The multi-stage screw **300** includes a first-stage screw **310** connected to the driven pulley **440** and provided with a thread that is formed on the outer circumferential surface thereof, a second-stage screw **320** screwed to the first-stage screw **310** and provided with a thread that is formed on the outer circumferential surface thereof, a third-stage screw **330** screwed to the second-stage screw **320** and provided with a thread that is formed on the outer circumferential surface thereof, and a screw housing **340** screwed to the outside of the third-stage screw **330** and provided with a top end that is fixed to the paper support plate **200**. Accordingly, the first-stage screw **310** is coupled to the shaft of the driven pulley **440**, and the driven pulley **440** is connected to the driven pulley **430** by the chain **450**.

Thereafter, when the motor **420** is driven to rotate, the driven pulley **440** connected by the chain **450** is rotated in conjunction with the rotation of the main pulley **430**, and the first-stage screw **310** connected to the driven pulley **440** is rotated clockwise or counterclockwise.

When the motor **420** of the power unit **400** is rotated in response to a drive signal from the controller **500**, the second-stage screw **320** is raised when the first-stage screw **310** is rotated clockwise. At the time at which the raising of the second-stage screw **320** ends, the third-stage screw **330** is rotated together with the first-stage screw **310** and is raised. Accordingly, since the paper support plate **200** is elevated by the raising of the second-stage screw **320** and the third-stage screw **330**, paper may be moved upward.

The paper support plate **200** may move stably in a state of being coupled to the guide rails **120** and guide rods **140** to prevent shaking during an elevation operation.

The guide rails **120** are installed symmetrically and vertically on both sides of the inner side of the main body **100**, and the insertion recesses **240** into which the guide rails **120** are inserted are formed at both corners of the paper support plate **200**.

The guide rods **140** are disposed in vertical directions parallel to the guide rails **120**, and are coupled through the paper support plate **200**.

The paper support plate **200** is provided with the bushings **220** so that the guide rods **140** penetrate and slide stably during an elevation operation. The bushings **220** are each formed in a cylindrical shape having upper and lower openings.

Furthermore, an end of the paper is supported by the guide rails **120** and the guide rails **120** serve as protective guards, so that damage to the paper can be reduced by reducing the frictional force between contact surfaces.

Meanwhile, when the amount of paper loaded on the paper support plate **200** decreases, the sensor **S** detects the decrease in load, and the controller **500** operates the power unit in association with the decrease in weight detected by the sensor. That is, the multi-stage screw **300** is extended by driving the motor **420**, and thus the paper support plate **200** is moved upward in association with the moving distance calculated based on the decrease in weight. Paper has a predetermined weight depending on itself. The number of pages of paper discharged may be calculated through the decrease in the weight of paper. Therefore, the number of pages of paper discharged is calculated by the reduced weight, the height of the paper discharged, i.e., the moving distance, is calculated through the calculated number of pages, and the paper support plate **200** is elevated in association with the moving distance according to the reduction in weight.

Furthermore, the controller **500** further includes a height detection unit **540** configured to detect whether the paper

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support plate **200** reaches a desirably set remaining amount height. The controller **500** generates a paper shortage signal when the height detection unit **540** detects a situation in which the paper support plate **200** reaches the set remaining amount height. The controller **500** transmits the paper shortage signal to a communication unit **C11** when the height detection unit **540** detects a situation in which the paper support plate **200** reaches the set remaining amount height.

The communication unit **C11** is integrated with or provided to correspond to the paper feeding apparatus, and receives a paper shortage signal from the controller when the paper feeding apparatus senses a paper shortage state.

When the amount of paper loaded on the paper support plate **200** decreases, the sensor **S** detects the decrease in load. Furthermore, when the height detection sensor **540** of the controller **500** detects a situation in which the paper support plate **200** reaches the set remaining amount height in association with the decrease in weight detected by the sensor, the controller **500** generates a paper shortage signal, the controller **500** transmits the generated paper shortage signal to the communication unit **C11**, and the communication unit **C11** informs the paper feeding terminal **C21** of the paper shortage state over the communication network so that the paper feeding apparatus **10** can be replenished with paper.

The communication unit **C11** is connected to the paper feeding terminal **C21** over a communication network.

The communication network is a network connected for the purpose of enabling communication between terminal users. The communication network is connected to one or more terminals, links, terminal nodes, network switches, exchanges, and/or nodes, and/or the like, and enables electrical communication. The communication network includes wired and wireless communication networks such as 3G, 4G, LTE, Bluetooth, Wi-Fi, ZigBee, NFC, RFID, Ethernet, ISDN, NGN, NPL network, VPN, MAN, switch, router, overlay, Epanet, BINET, Internet, intranet, local area network (LAN), wide area networks (WAN), storage area networks (SAN), cell, and/or satellite networks, and/or combinations thereof, but are not limited thereto.

A short-range communication module (not shown) may be provided between the communication unit **C11** and the paper feeding apparatus **A** to provide notification of a result from the paper feeding apparatus **A** to the communication unit **C11** when a paper replenishment request state or a paper replenishment completion state is sensed. The short-distance communication method used herein may be, e.g., Bluetooth, ZigBee, VPN, or Wi-Fi, but is not limited thereto.

The operation process of the present invention will be described with reference to FIGS. **4A-4C** and **5** as follows:

As shown in FIG. **4A**, paper is completely filled. In the process of filling stacked paper, the paper support plate **200** continues to be lowered depending on the reverse rotation of the multi-stage screw **300** by the operation of the motor **420**.

The operation of the motor **420** is stopped until the weight of the paper support plate **200** is measured and reaches an appropriate weight, and paper is filled. Meanwhile, a height detection unit **L1** may be further formed in the lower part of the inside of the main body **100**. The controller **500** stops the operation of the motor **420** when the height detection unit **L1** detects a situation in which the paper support plate **200** reaches a desirably set remaining amount height, thereby preventing the paper support plate **200** from being lowered below the set remaining amount height.

As shown in FIG. **4B**, when a predetermined amount of paper is removed and thus a small amount of paper is exhausted, the motor **420** is operated in response to the

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detection of a change in weight by the sensor S and an operation signal from the controller 500, and thus the multi-stage screw 300 is rotated, thereby causing the paper support plate 200 to be raised. Since the number of pages of paper discharged is calculated by the reduced weight, the height of the paper discharged is calculated to calculate the moving distance, and the paper support plate 200 is raised by the calculated moving distance. When the paper support plate 200 is raised by the moving distance, the operation of the motor 420 is stopped. Accordingly, when a predetermined amount of paper is withdrawn, the paper support plate is raised by the amount of change in weight so that the paper is always placed in the paper discharge outlet 101 and is ready to be withdrawn at all times.

The controller 500 further includes a height detection unit 540 configured to detect whether the paper support plate 200 reaches a desirably set remaining amount height. As shown in FIG. 4C, when the amount of paper loaded on the paper support plate 200 decreases, the sensor S detects the decrease in load. Furthermore, when the height detection sensor 540 of the controller 500 detects a situation in which the paper support plate 200 reaches the set remaining amount height in association with the decrease in weight detected by the sensor S, the controller 500 generates a paper shortage signal. Meanwhile, the controller 500 informs the paper feeding terminal C21 of the paper shortage signal over an external communication network so that the paper feeding apparatus 10 can be replenished with paper.

Referring to FIG. 5, the controller 500 of a paper feeding apparatus A according to an embodiment of the present invention senses a shortage of stacked paper and the completion of paper replenishment through the height detection unit 540.

When a paper shortage state is sensed in step S01, the communication unit C11 transmits a paper replenishment request signal S11 to the first server C21 over the communication network N1.

When a company that rents, provides, or manages the paper feeding apparatus A where the first server C21 is located checks the paper replenishment request signal S11 through the first server C21, the company checks information about the paper feeding apparatus A, and then feeds paper offline in step S51. Furthermore, when a paper replenishment completion state is sensed by the paper feeding apparatus A in step S02 in a state in which the paper feeding apparatus A has been replenished with paper, the communication unit C11 transmits a paper replenishment completion signal to the first server C21 through the communication network N1 depending on the detection in step S12.

When the replenishment of paper is completed by a paper supplier and the paper feeding apparatus A senses a paper replenishment completion state, the communication unit C11 transmits a paper replenishment completion signal S12 to the first server C21, so that the first server C21 side can be notified that paper replenishment is completed in the corresponding paper feeding apparatus A.

A short-range communication module (not shown) may be provided between the communication unit C11 and the paper feeding apparatus A to provide notification of a result from the paper feeding apparatus A to the communication unit C11 when a paper replenishment request state or a paper replenishment completion state is sensed. The short-distance communication method used herein may be, e.g., Bluetooth, ZigBee, VPN, or Wi-Fi, but is not limited thereto.

Meanwhile, when receiving the paper replenishment request signal S11, the first server C21 may transmit a paper payment request signal S31 to the communication unit C11.

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When the paper payment request signal S31 is transmitted, a payment-related window on a web browser may pop up on the communication unit C11 or a separate payment-related program may be executed. When payment is completed by the manager of the communication unit C11, a payment completion state may be checked in real time on the first server C21. When the manager of the first server C21 becomes aware that payment has been completed by checking paper payment-related information checked on the first server C21 after the payment by the manager of the communication unit C11, paper is finally fed offline by the manager of the first server C21 in step S51. The manager of the communication unit C11 may make a payment using CMS automatic transfer as a default, but a payment method is not limited thereto.

The present invention is not limited by the above-described embodiments and the accompanying drawings. Various modifications and applications not illustrated may be made within the scope of the technical spirit of the present invention, and the substitution of components and changes to other equivalent embodiments may also be made. Therefore, such modifications and applications related to the features of the present invention should be construed as being included within the scope of the present invention.

The invention claimed is:

1. A paper feeding apparatus comprising:

a main body configured such that a paper discharge outlet is formed in an upper portion of a front side thereof, a space is formed therein, and a door configured to be selectively opened and closed is formed in the front side thereof;

a paper support plate formed in a plate shape so that paper is stacked and supported thereon;

an elevation unit installed inside the main body, and configured to selectively elevate and lower the paper support plate;

a power unit mounted in a lower part of the main body, and configured to move the paper support plate;

a sensor configured to measure a weight of the paper stacked on the paper support plate; and

a controller configured to control driving of the power unit in conjunction with the sensor;

wherein the controller:

when the sensor detects a change in weight of the stacked paper, elevates the paper support plate in association with a moving distance calculated according to a reduction in weight by driving the motor to extend a multi-stage screw; and

further includes a communication unit configured to transmit a paper replenishment request signal when the paper feeding apparatus senses a paper shortage state and transmit a paper replenishment completion signal when the paper feeding apparatus senses a paper replenishment completion state;

wherein the controller further includes a first height detection unit configured to detect whether the paper support plate reaches a first set remaining amount height; and the controller generates a paper shortage signal when the first height detection unit detects a situation in which the paper support plate reaches the first set remaining amount height;

wherein the elevation unit includes: a plurality of guide rails formed inside the main body in a vertical direction; a plurality of guide rods formed inside the main body in a vertical direction, and arranged in parallel with the guide rails; and a multi-stage screw formed under the paper support plate;

wherein the paper support plate is configured such that a plurality of bushings to be fitted around the guide rods are formed and insertion grooves into which the guide rails are coupled are formed therein;

wherein the power unit includes a motor mounted in a lower part of the main body and provided with a driving pulley, a driven pulley formed at a lower end of the multi-stage screw, and a chain configured to connect the driving pulley and the driven pulley; and

wherein the multi-stage screw includes: a first-stage screw connected to a driven pulley, and provided with a thread that is formed on an outer circumferential surface thereof; a second-stage screw screwed to the first-stage screw, and provided with a thread that is formed on an outer circumferential surface thereof; a third-stage screw screwed to the second-stage screw, and provided with a thread that is formed on an outer circumferential surface thereof; and a screw housing screwed to an outside of the third-stage screw, and provided with a top end that is fixed to the paper support plate.

2. The paper feeding apparatus of claim 1, wherein: the controller further includes a second height detection unit configured to detect whether the paper support plate reaches a second set remaining amount height; and

the controller stops an operation of the motor when the second height detection unit detects a situation in which the paper support plate reaches the second set remaining amount height, thereby preventing the paper support plate from being lowered below the second set remaining amount height.

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