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(54) **ACCUMULATION DEVICE FOR PAPER-LIKE SHEETS**

(57) An accumulation device for paper-like sheets comprises a conveying part, a clamping part, a guiding part and an accumulating part, which are connected serially. The conveying part is used for conveying the paper-like sheet to the clamping part. The clamping part comprises a drive shaft and multiple banknote-stacking wheels fixed to the drive shaft, and every banknote-stacking wheel is provided with multiple wheel blades having the same curvature. The paper-like sheet can be clamped between any two adjacent wheel blades and rotatably conveyed to the guiding part. The guiding part receives the paper-like sheet conveyed by the clamping part and guides the paper-like sheet to the accumulating part. The accumulating part is used for accumulating the paper-like sheet conveyed by the guide part. The paper-like sheets are reliably collected among the wheel blades and prevented from scattering, and thus the paper-like sheets can be uniformly arranged in order and stacked on the accumulating part.

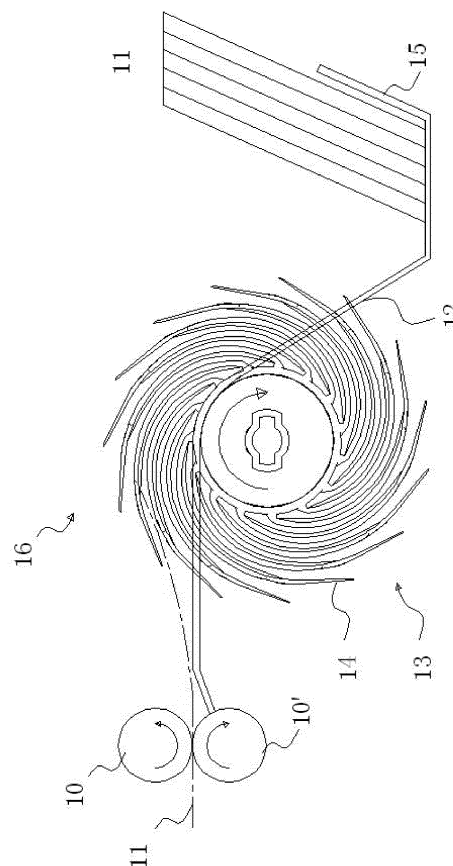


Fig. 1

Description

[0001] The present application claims the benefit of priority to Chinese Patent Application No.201210153172.3 titled "PAPER SHEET GATHERING DEVICE", filed with the Chinese State Intellectual Property Office on May 17, 2012, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present application relates to a paper sheet gathering device, and particularly to a paper sheet gathering device that conveys paper money, checks, paper representing value and the like with vanes of stacking wheels.

BACKGROUND OF THE INVENTION

[0003] The paper sheet gathering device refers to a device that conveys paper sheets (such as paper money, checks and paper representing value) at a predetermined number (for example, 100) and gathers the same at a gathering component. In the paper sheet gathering device, paper sheets conveyed continuously are received between two adjacent vanes of the stacking wheel and thus are rotationally conveyed, such that the paper sheets are dropped and stacked on the gathering component. In the device, the paper sheets are supplied with power by conveying wheels, and are received between any two vanes of the stacking wheel longitudinally or transversely, such that the paper sheets are rotationally conveyed with the rotation of the stacking wheel until they are conveyed to the gathering component for stacking. In the course that the paper sheets are rotated together with the stacking wheel, head portions of the paper sheet are interposed between root portions of the two adjacent vanes of the stacking wheel, while tail portions of the paper sheets are protruded out of the conveying wheel and are rotated, together with the head portions of the paper sheets, along with the stacking wheel.

[0004] In the existing paper sheet gathering device, since the interval between adjacent vanes of the stacking wheel is large, no sufficient clamping force is applied to the paper sheets such that they are rotationally conveyed, the head portions of the paper sheets are away from the root portions of the vanes of the stacking wheel increasingly under the action of the centrifugal force, thereby the paper sheets are moved out of the range between the two vanes of the stacking wheel, resulting in the straggle and irregular stacking of the paper sheets.

SUMMARY OF THE INVENTION

[0005] An object of the present application is to provide a paper sheet gathering device which achieves the reliable reception of the paper sheets between wheel vanes, and can avoid the straggle of the paper sheets received

between the wheel vanes, such that the paper sheets are uniformly aligned and are stacked on a gathering component.

[0006] The present application provides a paper sheet gathering device including a conveying component, a clamping component, a guiding component and a gathering component which are connected with each other in sequence.

[0007] The conveying component is configured for conveying the paper sheet to the clamping component.

[0008] The clamping component includes a driving shaft and a plurality of stacking wheels fixedly connected to the driving shaft, and each stacking wheel has a plurality of vanes which have equal radians, thereby the paper sheet can be clamped between any two adjacent vanes and be rotationally conveyed to the guiding component.

[0009] The guiding component is configured for receiving the paper sheet conveyed by the clamping component, and guiding and conveying the paper sheet to the gathering component.

[0010] The gathering component is configured for gathering paper sheets conveyed by the guiding component.

[0011] Further, vanes of the plurality of stacking wheels have different radians.

[0012] Further, at least the vane of one of the plurality of stacking wheels has a different radian from those of the rest of the plurality of stacking wheels.

[0013] Further, the plurality of stacking wheels have the same vane opening direction.

[0014] According to the present application, by arranging a third stacking wheel having a different radian between a first stacking wheel and a second stacking wheel, the paper sheet can be reliably received between adjacent vanes. In addition, the surface of the received paper sheet can be formed with convex-concave folds, thereby the friction force between the vane and the paper sheet is increased, which can effectively prevent the paper sheet from moving away from the vanes of the stacking wheel. Thereby the paper sheet can be uniformly aligned and stacked on the gathering component. Meanwhile the straggle of the paper sheets is avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Figure 1 is a side view of a paper sheet gathering device according to an embodiment of the present application;

Figure 2 is a front view of stacking wheels according to the embodiment of the present application; and

Figure 3 is a side view of the stacking wheels according to the embodiment of the present application.

DETAILED DESCRIPTION

[0016] Hereinafter, the present application will be described in detail in conjunction with the accompanying drawings, such that the object, technical solutions and advantages thereof become more apparent.

[0017] As shown in Figure 1 which is a side view of a paper sheet gathering device according to an embodiment of the present application. The paper sheet gathering device 16 according to the present application is a device for receiving paper sheet 11 such as paper money, checks and paper representing value longitudinally or transversely, the paper sheet gathering device 16 includes a conveying component, a clamping component, a guiding component 12 and a gathering component 15 which are connected with each other in sequence.

[0018] The conveying component includes a pair of conveying rollers (10, 10') for conveying the paper sheet 11 to the clamping component.

[0019] The clamping component includes a driving shaft and three stacking wheels 13 fixed to the driving shaft. Each stacking wheel 13 has a plurality of vanes 14 which have equal radians. The paper sheet 11 can be clamped by any two adjacent vanes, and is conveyed, with the rotation of the stacking wheel, to the guiding component.

[0020] The guiding component 12 is configured for receiving the paper sheet 11 conveyed by the clamping component, and guiding and conveying the paper sheet to the gathering component 15.

[0021] The gathering component 15 is configured for gathering the paper sheet 11 conveyed by the guiding component 12.

[0022] The operating principle of the present application is as follows: paper sheets 11 are continuously supplied to the stacking wheel 13 one by one at a certain speed and in a predetermined direction by the pair of conveying rollers (10, 10'). Then the paper sheets 11 are conveyed one by one with the rotation of the stacking wheel 13, and are then conveyed by the guiding component while right and left sides of the paper sheets 11 are abutted on the guiding component 12. In this way, the paper sheets 11 are moved along the guiding component 12 which is inclined downward in the midcourse of the conveying. Finally, the paper sheets 11 are moved away from the stacking wheel 13 and are gathered on the gathering component 15 under their own weights.

[0023] As shown in Figure 2, the three stacking wheels 13 includes: a pair of stacking wheels, that is, a first stacking wheel 13a and a second stacking wheel 13a, having the same radian and fixed to the driving shaft 20 at an interval narrower than the width of the paper sheet 11; and a third stacking wheel 13b fixed to the driving shaft 20. As shown in Figure 3, the phase of the third stacking wheel 13b is the same with that of the first and the second stacking wheels 13a, but the radian of vanes 14b of the third stacking wheel 13b is different from that of vanes 14a of the first and the second stacking wheels 13a, while

the opening radians are the same, so as to ensure the smooth insertion of the paper sheet 11.

[0024] The present application is characterized in that the third stacking wheel 13b is configured in a manner that it has the same phase as that of the first and the second stacking wheels 13a and has a radian different from that of the first and the second stacking wheels 13a. Thereby, the paper sheet 11 moved into intervals between adjacent vanes 14a of the first and the second stacking wheels 13a is formed with an upwardly protruded convex fold 30 or a downwardly protruded concave fold 31 at the middle portion of the paper sheet 11 under the action of the vane 14b of the third stacking wheel 13b. In this way, the paper sheet 11 received between the vanes 14a is rotationally conveyed in a state that a certain friction force is applied thereon by the convex fold 30 and the concave fold 31, which can prevent the paper sheet 11 from being moved away from the vanes 14 of the first, second and third stacking wheels 13 easily while being rotationally conveyed, and thus preventing the straggle of the paper sheets 11 being rotationally conveyed.

[0025] Furthermore, in the present embodiment, as shown in Figure 3, the distance between tops of adjacent vanes 14a of the first and second stacking wheels 13a along the outer circumference is designed as p ; the vanes of the third stacking wheel 13b are designed to have the same phase as that of the vanes of the first and second stacking wheels 13a; and the vanes 14b of the third stacking wheel 13b are designed to have a radian different from that of the vanes 14a of the first and second stacking wheels 13a, with the minimum thereof being a half pitch, i.e., $1/2p$, while the radians of the openings are the same or slightly different, so as to ensure the smooth insertion of the paper sheets 11. However, the minimum distance of the radian is not limited to the half pitch $1/2p$, the same effect can be obtained in cases that the minimum distance of the radian is designed to be smaller or larger than the half pitch $1/2p$. Besides the shape of the radian is not limited to the present application, and may have any shape.

[0026] The above embodiments are only preferred embodiments of the present application, which could not be construed to limit the scopes of the claims of the present application. It should be noted that, the person skilled in the art may make many modifications and improvements to the present application without departing from the principle of the present application, and the modifications and improvements should also be deemed to fall into the protection scope of the present application.

Claims

1. A paper sheet gathering device comprising a conveying component, a clamping component, a guiding component and a gathering component which are connected with each other in sequence; wherein

the conveying component is configured for conveying the paper sheet to the clamping component; the clamping component comprises a driving shaft and a plurality of stacking wheels fixedly connected to the driving shaft, and each stacking wheel has a plurality of vanes which have equal radians, thereby the paper sheet can be clamped between any two adjacent vanes and be rotationally conveyed to the guiding component; the guiding component is configured for receiving the paper sheet conveyed by the clamping component, and guiding and conveying the paper sheet to the gathering component; and the gathering component is configured for gathering paper sheets conveyed by the guiding component.

2. The paper sheet gathering device according to claim 1, wherein vanes of the plurality of stacking wheels have different radians.

3. The paper sheet gathering device according to claim 1, wherein at least the vane of one of the plurality of stacking wheels has a different radian from those of the rest of the plurality of stacking wheels.

4. The paper sheet gathering device according to claim 1, wherein the plurality of stacking wheels have the same vane opening direction.

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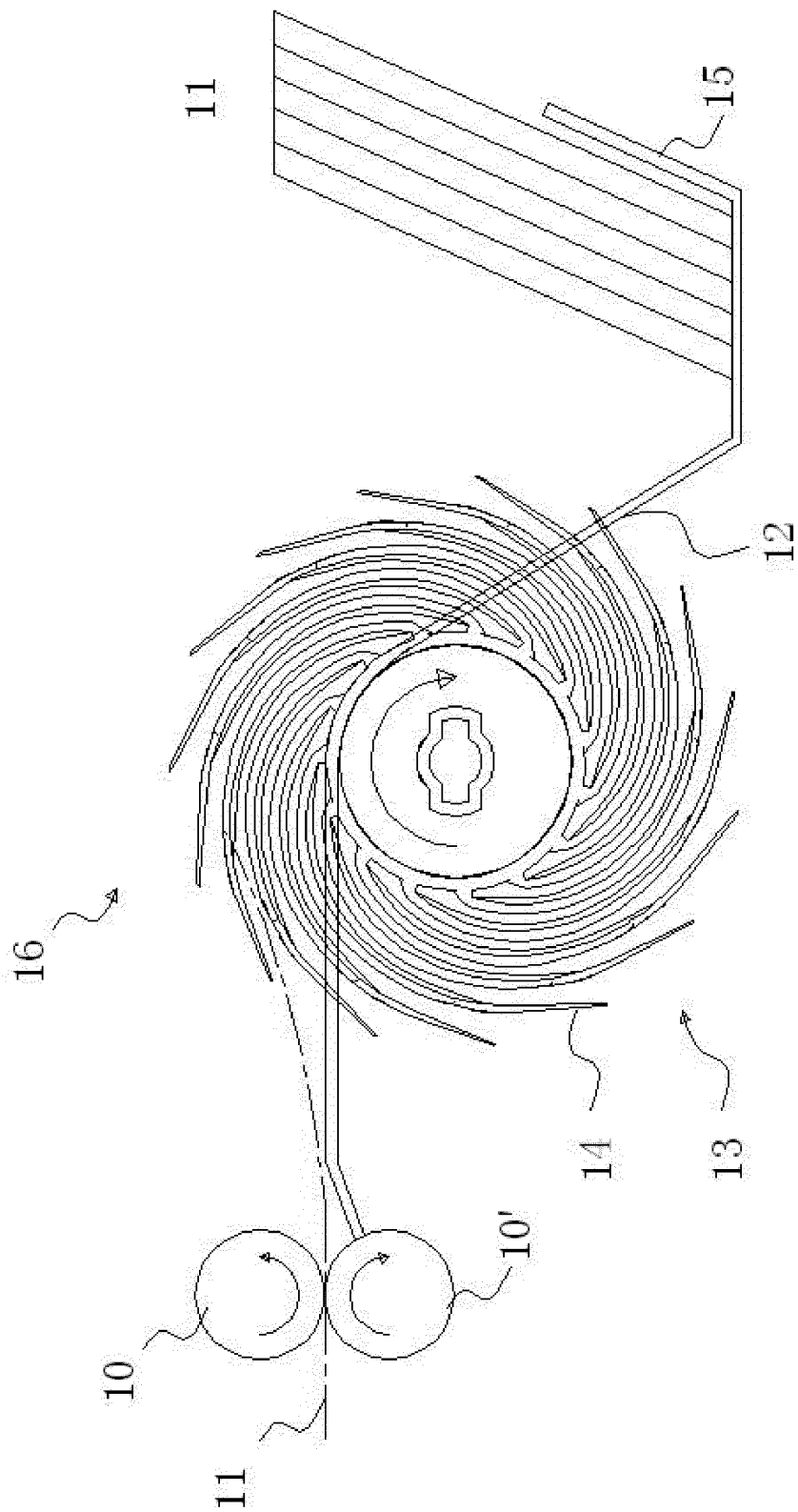


Fig. 1

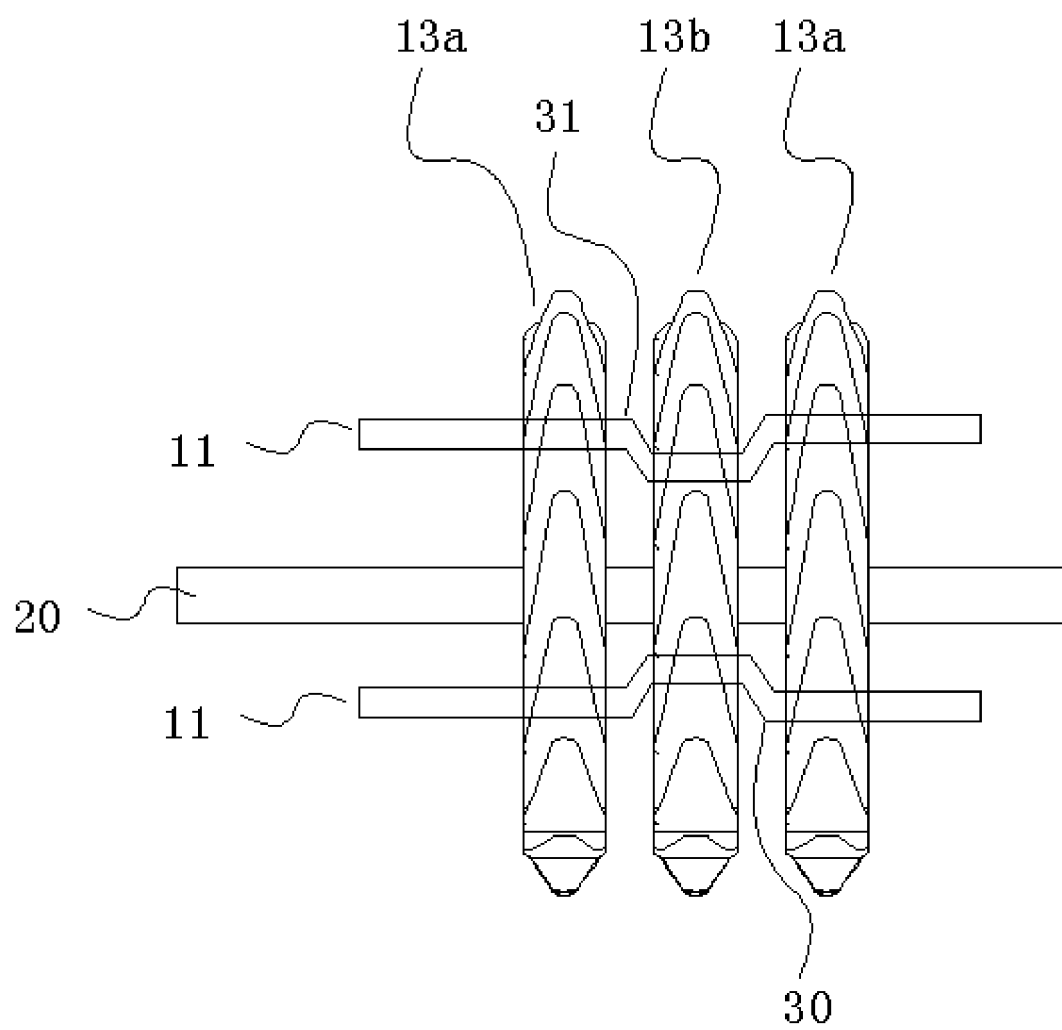


Fig. 2

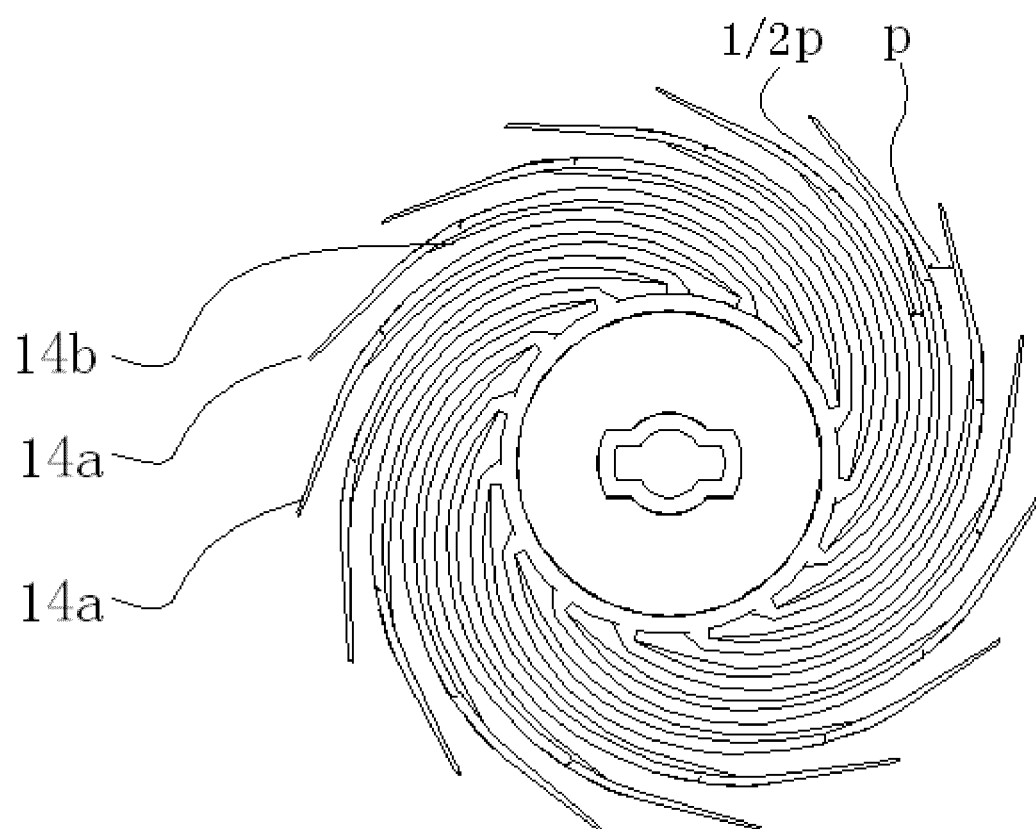


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/073169

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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)

IPC: B65h 29/20, B65H 29/22, B65H 39/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

WPI, EPODOC, CNPAT: gather, wheel, vane, impeller?, stack+, arc+, curvature

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/073169

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/073169

CLASSIFICATION OF SUBJECT MATTER

B65H 29/22 (2006.01) i

B65H 39/065 (2006.01) i

REFERENCES CITED IN THE DESCRIPTION

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