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SEPARATING DEVICE, SPLITTING DEVICE FOR A SEPARATING DEVICE AND METHOD FOR OPERATING A SEPARATING DEVICE

Description:

The invention relates to a singulating device for singulating a stack of paper or cardboard sheets, including at least one separating device, by means of which the stack can be flown by a gas flow, in particular an airflow, for singulating the paper or cardboard sheets. The invention further relates to a separating device for such a singulating device as well as to a method for operating a singulating device.

US 1 493 167 A discloses a device for singulating sheets of a stack. The device includes stack guides arranged at respective corners of the stack with flanges arranged at an angle to each other. A steel pipe is received between the flanges, by means of which an airflow for singulating the uppermost sheets can be conducted to a corner of the stack. For directing the airflow, the steel pipe comprises a vertical slot at the upper end thereof.

From JP 2013 006696 A, a sheet feeding device is known, by means of which individual paper sheets can be removed from a bottom side of a paper stack. The sheet feeding device includes a container with components for guiding and retaining the paper stack. The paper sheets can be individually withdrawn at an exit of the container located at the bottom by means of a suction cup.

A device for singulating plates can already taken as known from WO 2009/050953 A1. The device there includes multiple ultrasonic vibrating units to supply mutually different edges of a plate resting on the top on a plate stack with ultrasonic oscillations to thereby generate a gap. Furthermore, the device there includes an air nozzle for blowing gas into the gap between the uppermost plate and the plate stack to separate the uppermost plate from the plate stack.

DE 1 561 173 A1 discloses an apparatus for machine ventilation of stacks of cardboard or paper sheets. Therein, the stack is inserted into the apparatus tilted, thus horizontally resting on a side surface, which is formed by the sheets stacked on top of each other, whereby the frontmost sheet and the rearmost sheet of the stack are at one level. In order to separate individual cardboard sheets of the stack from each other, the apparatus comprises a lifting member, by means of which individual cardboard sheets of the stack can be displaced in vertical direction from their original position and vibrated. For better separating the individual, displaced cardboard sheets, they are flown by compressed air via a nozzle of the apparatus, wherein the nozzle is arranged opposing the lifting member such that the stack is located between the nozzle and the lifting member.

The invention is based on the object to provide an improved singulating device, an improved separating device as well as an improved method of the initially mentioned type, by means of which singulation of sheets of a stack is particularly reliably effected with particularly low effort.

This object is solved by a singulating device according to claim 1, by a separating device according to claim 12 as well as by a method according to claim 13. Advantageous configurations with convenient developments of the invention are specified in the respective dependent claims, wherein advantageous configurations of the singulating device are to be regarded as advantageous configurations of the method as well as of the separating device and vice versa.

A first aspect of the invention relates to a singulating device of the initially mentioned type, by means of which a particularly reliable singulation of sheets of a stack particularly low in effort is effected, wherein it is provided that a separating device comprises at least one angled aligning unit for aligning the stack and at least one first opening formed as a passage opening through the angled aligning unit, by means of which the stack can be flown by at least one gas flow for singulating the paper or cardboard sheets. The aligning unit formed angled can be abutted on at least one side surface of the stack with at least one wall element of

the aligning unit. By the angled aligning unit, thus, it can be prevented that the individual paper or cardboard sheets, which are referred to as sheets in the following in simplifying manner, undesirably move in relation to each other, which can in particular be the case upon flowing the stack by means of the gas flow. By supplying the sheets stacked on top of each other with the gas flow, an air cushion or an air gap is introduced at least in certain areas, thus between some of the sheets, by means of which it is prevented that upon singulating the stack, thus in lifting the respectively uppermost sheet from the stack, underlying sheets are lifted and transported away at the same time. By flowing by the gas flow, the singulation is thus particularly low in effort since adhesion of multiple sheets to each other is prevented with simple means. Without flowing by the gas flow, namely, an undesired, simultaneous transport of multiple sheets can occur due to the sometimes extensive contact of two adjacent sheets, since a negative pressure arising between the sheets upon perpendicularly moving them apart can result in an at least temporary adhesion of the sheets to each other. The configuration of the aligning unit formed angled with the first opening allows both defined flowing and aligning the stack.

By a possible transport of multiple sheets at the same time, thus with unsuccessful singulation, failures in further processing machines can for example occur, which are to be supplied with individual sheets by the singulating device. Here, pressing, stamping and/or cutting devices for paper or cardboard sheets can be cited as examples, at which failures are caused if they are loaded with a thin stack of two or more sheets. This is particularly effectively prevented by the gas flow generated and directed by the singulating device according to the invention. Therein, the use of an airflow as the gas flow particularly lends itself due to the uncomplicated handling of air. The passage opening and thereby the gas flow is for example oriented to a side surface of the stack and thus perpendicularly to the lateral edges of the sheets lying on top of each other. Alternatively thereto, the passage opening and the gas flow, respectively, can also be inclined towards the support surface of the stack instead of this horizontal orientation and thereby include an acute angle with the surface of the uppermost sheet. With sufficient intensity of the gas flow,

sheets of plastic, wood or metal or any other material can for example also be separated from each other by means of the singulating device besides the described paper or cardboard sheets.

According to the invention, the angled aligning unit comprises at least one second opening, by means of which the stack can be flown by the gas flow for singulating the paper or cardboard sheets, wherein the gas flow can be divided into at least two partial flows by means of the first opening and the second opening, which are oriented to the stack, and wherein the second opening is configured as a passage opening just as the first opening. By flowing the stack by means of the first and the second opening, thus by the two partial flows, a particularly uniformly distributed air cushion can be established between the sheets to be separated. In other words, thus, the adhesion of adjacent sheets to each other is particularly extensively prevented. The first opening and additionally or alternatively the second opening can for example also comprise a nozzle endpiece slotted parallel to the support surface of the stack and thus parallel to the contact surface between the sheets or a slotted constriction, which is accordingly arranged at the angled aligning unit. Thus, the gas flow is particularly widely spread and forms a particularly uniform, wide gas cushion between the adjacent sheets. In addition, it can thereby be effectively and purposefully prevented that too many of the sheets resting on top are flown at the same time, but in particular only the uppermost two sheets. By the use of such a slotted nozzle endpiece or a slotted constriction, the flow velocity of the gas flow can be increased. The gap between the sheets can then be easier generated even with reduced gas flow compared to a round cross-section of the first opening and additionally or alternatively the second opening.

In an advantageous configuration of the device according to the invention, the angled aligning unit comprises at least two wall elements arranged perpendicular to each other for aligning the stack. Therein, the two wall elements can for example be arranged at a right angle to each other and be connected or alternatively thereto screwed in firmly bonded manner to name just some possible connecting types. Therein, the arrangement at a right angle is not necessarily

required, but should be advantageously adapted to the corner angles of the sheets to be singulated. If the sheets for example have a hexagonal contour, thus, there is the possibility that the two wall elements accordingly include a 120° angle and thus can be tightly abutted on the stack of hexagonal sheets. Thus, the two wall elements form a suitable stop for aligning the stack in the area around an edge of the stack, which is enclosed by the two wall elements of the angled aligning unit at least in certain areas. In this case, the passage opening for the gas flow can for example be arranged at an edge of the sheet of the stack resting on the top opposing this edge such that a possible occurring offset of the sheets relative to the remaining stack occurring upon supplying with the gas flow is effectively prevented by the angled aligning unit. By enclosing the edge in certain areas at least in the uppermost area of the stack by the angled aligning unit, drifting away caused by the gas flow, thus the relative movement between the uppermost sheet or the sheets resting on the top and the remaining stack, is for example effectively prevented in at least two directions lying in a horizontal plane. Therein, that area of the stack is to be understood by "uppermost area" of the stack, in which the paper or cardboard sheets are individually lifted from the stack.

According to a further advantageous configuration of the device according to the invention, thus, the angled aligning unit surrounds a corner of the stack, which faces away from a base area, i.e. a support area of the stack, at least in certain areas. The angled aligning unit or the wall elements thereof, which form an angle such as for example a right angle, are arranged in the uppermost area of the stack in this case and there enclose one of the corners of the stack at least in certain areas. Thereby, the sheets of the stack least loaded by the other sheets are specially aligned. This is particularly advantageous since the uppermost sheet or the uppermost sheets of the stack are least loaded by weight and accordingly can particularly easily drift away upon blowing-in the gas flow. In contrast thereto, the lower sheets are pressed by the weight force of the sheets lying above and just therefore tend less to be exposed to a possible offset or shift caused by the gas flow.

In addition, there is the possibility that the respective flow directions of the two partial flows preset by the first opening and the second opening intersect each other after their exit from the openings. The partial flows can both for example flow in at a corner of the upper or uppermost sheets and thus generate a gap induced by the gas flow between the respectively adjacent sheets resting on the top at this corner. Therein, the respective corner is formed by a first edge and by a second edge adjacent thereto, for example extending at a right angle to the first edge, of the respective sheets resting on the top. The one partial flow is now for example oriented perpendicular to the first edge and the other partial flow is oriented perpendicular to the second edge. This results in the fact that the two partial flows meet between the respective flown sheets and form a vertical flow in the intersection area of the partial flows, by means of which the sheets can be particularly effectively spaced from each other, thus pressed apart. Therein, the vertical flow has at least a first flow portion, which is directed towards the support surface of the stack, and a further second flow portion coaxial thereto, which is oriented opposed thereto. The first and the second opening for the gas flow can for example also be oriented axially aligned with each other at the separating device. This can be particularly easily accomplished if the first opening is formed as a passage opening of the one wall element and the second opening is formed as a passage opening of the other wall element of the aligning unit, wherein both openings are supplied with compressed air for example via a common supply port of the separating device. Therein, the first opening and the second opening are for example connected to each other within the separating device, thus within the angled aligning unit. The partial flows can both for example flow towards each other at the corner of the stack and be axially oriented to each other. In the area of the meeting of the partial flows, a particularly severe deflection of both partial flows and as a result an effective upwards and downwards flow oriented approximately perpendicularly to the partial flows can occur, which exert an even greater pressure on the contact surfaces of the sheets to be singulated from each other compared to the just mentioned first flow portion and the second flow portion and thus even more effectively space them from each other.

In a further advantageous configuration of the singulating device according to the invention, it includes two separating devices, which are retained at a distance to each other on sides of a retaining device of the singulating device opposing each other, which distance at least substantially corresponds to an edge length of the stack. In that the separating devices are retained at the distance to each other, which at least substantially corresponds to the edge length of the stack, the gas flows of both separating devices can be specifically oriented to adjacent corners of the paper or cardboard stack. Thus, the separating devices are retained at the distance, at which the aligning units thereof particularly tightly abut on the stack. Thereby, a uniform air gap is provided between the sheets to be singulated on the one hand, whereby a relative adhesion of the sheets to be singulated to each other is particularly effectively prevented. In addition, the area of the paper or cardboard stack, on which the aligning units abut, is reliably protected against displacement or shift of the sheets to be singulated. A relative movement of the two separating devices to each other is effectively prevented by means of the retaining device.

In a further advantageous configuration of the singulating device according to the invention, it includes at least one vibrating device, by means of which pulses, in particular mechanical force impacts, can be exerted on the stack. Therein, the vibrating device preferably exerts pulses on the side surfaces of the stack and thus on the edges of the sheets lying on top of each other. Thereby, the sheets are moved in relation to each other over a short path distance, which is limited by the aligning unit, thus after which the sheets abut on the aligning unit, which favors the formation of the air cushion or gas cushion between the sheets to be singulated. Already by exerting the pulses, a transition from static friction towards dynamic friction between the sheets to be singulated is effected. Thereby, a formation of the gas cushion, thus the gap or air gap between the sheets at least in certain areas can occur, which is even further increased by flowing by the gas flow or the partial flows. In other words, a minimum gap between the sheets lying on top of each other is generated by means of the pulses and thereby a zone of attack for the gas flow is provided in particularly effective manner, in which the gas flow can

flow particularly effectively between two adjacent sheets, which are to be singulated. The vibrating unit can be operated independently of the angled aligning unit and be arranged separated from it. In particular, the vibrating unit is arranged in the area of the paper and cardboard sheets to be singulated. In addition, there is the possibility that the vibrating device is arranged at the angled aligning unit. In other words, the angled aligning unit itself vibrates in this arrangement, which is for example allowed in that vibrating plate elements are arranged at the wall elements. The vibrating device is integrated in the angled aligning unit in this case. Thereby, the pulses generated by the vibrating device can be particularly specifically matched to flowing by the gas flow.

In a further advantageous configuration of the singulating device according to the invention, it includes guiding elements, by means of which at least some of the paper or cardboard sheets of the stack to be singulated can be aligned along a singulating direction. Therein, the singulating direction corresponds to the direction, along which the sheets to be singulated are moved away from the stack. Thus, a rotation of the sheets to be singulated in their resting plane and thus parallel and in relation to the base area of the stack can be effectively prevented by means of the guiding elements.

In a further advantageous configuration of the invention, the singulating device comprises at least one downholding device for temporarily holding down the paper or cardboard sheets of the stack. By means of the downholding device, a pressure force directed towards the support surface of the stack can be exerted on the sheets of the stack shortly after lifting an individual sheet from the stack. Thereby, co-movement as a result of a suction effect, which can be exerted on the underlying sheet by lifting the uppermost sheet, or blowing away further sheets can be effectively prevented. Upon lifting the uppermost sheet, which is to be singulated, therein, a pressure force is not exerted by the downholding device since otherwise there is the danger of retaining and pressing down the sheet to be singulated.

In a further advantageous configuration of the singulating device according to the invention, it includes at least one transport device for lifting paper or cardboard sheets to be singulated and moving the paper or cardboard sheets to be singulated relative to the stack. While a particularly uniform gas cushion is formed between the sheets to be singulated by means of flowing by the gas flow, the transport device serves for lifting the respectively uppermost sheet and the movement thereof along the singulating direction. By means of the transport device, a retaining force is exerted on the sheet to be singulated, whereby it can be particularly fast moved away from the stack. Therein, the transport device can comprise at least one vacuum suction cup for lifting the paper or cardboard sheets to be singulated. By means of the vacuum suction cup, the retaining force can be applied to the sheet respectively to be singulated in particularly gentle manner without damaging the sheet.

A second aspect of the invention relates to a separating device for a singulating device, wherein a stack for singulating paper or cardboard sheets of the stack can be flown by a gas flow, in particular an airflow, by means of the separating device. Therein, the separating device comprises at least one angled aligning unit for additionally aligning the stack and a first opening formed as a passage opening through the angled aligning unit, by means of which the stack can be flown by the gas flow for singulating paper or cardboard sheets. According to the invention, the angled aligning unit comprises at least one second opening, by means of which the stack can be flown by the gas flow for singulating the paper or cardboard sheets, wherein the gas flow can be divided into at least two partial flows by means of the first opening and the second opening, which are oriented to the stack, and wherein the second opening is configured as a passage opening just as the first opening. The separating device can be particularly compactly configured and can thus be attached to the singulating device in a particularly low installation space. Solely thereby, the singulation of the sheets by means of the separating device can be performed particularly low in effort. In addition, the separating device allows particularly fast and reliable singulation of the respectively uppermost sheets of the stack. The features and advantages resulting from the

use of the device according to the first inventive aspect can be taken from the description of the first inventive aspect, wherein advantageous configurations of the first inventive aspect are to be regarded as advantageous configurations of the second inventive aspect.

A third aspect of the invention relates to a method for operating a singulating device, wherein a stack is flown by a gas flow, in particular an airflow, for singulating paper or cardboard sheets of the stack by at least one separating device of the singulating device. The paper or cardboard sheets are aligned by at least one angled aligning unit of the separating device. In addition, the stack is flown by the gas flow through a first opening formed as a passage opening through the angled aligning device for singulating the paper or cardboard sheets. According to the invention, the angled aligning device comprises at least one second opening, by means of which the stack is flown by the gas flow for singulating the paper or cardboard sheets, wherein the gas flow is divided into at least two partial flows by means of the first opening and the second opening, which are oriented to the stack, and wherein the second opening is configured as a passage opening just as the first opening. Herein, only some of the sheets are flown by the gas flow in particularly energy-saving manner and their relative offset to the remaining stack is prevented by the angled aligning unit. Thus, the respectively uppermost sheet of the stack can be separated from the underlying sheets of the stack particularly low in effort.

It is of further advantage if pulses, in particular mechanical force impacts, are additionally exerted on the stack by a vibrating device of the singulating device upon flowing the stack by the gas flow via the first opening. This allows particularly fast establishment of a gas cushion between the sheets to be singulated, especially if exerting the pulses is effected at the same time with the supply of the stack with the gas flow.

By the features of the method according to the invention, advantages arise, which can be taken from the descriptions of the first and the second inventive aspect,

wherein advantageous configurations of the first and the second inventive aspect are to be regarded as advantageous configurations of the third inventive aspect and vice versa.

There shows:

Fig. 1a a schematically illustrated perspective view to a singulating device according to the invention;

Fig. 1b a schematically illustrated side view of the singulating device according to Fig. 1a (direction Z according to Fig. 1a), wherein a transport device of the singulating device not shown in Fig. 1a is additionally illustrated;

Fig. 2a a schematic detailed representation of the singulating device according to the invention according to an area A indicated in Fig. 1a;

Fig .2b a schematic detailed representation of an angled aligning unit of the singulating device according to the invention; and

Fig. 2c a schematic detailed representation of the singulating device according to the invention according to an area B indicated in Fig. 1a.

Fig. 1a shows an embodiment of a singulating device 10 exemplary for the invention in a schematically illustrated perspective view, wherein the representation of a transport device 70 was omitted in Fig. 1a for reasons of clarity. This transport device 70, to which respective vacuum suction cups 72 also belong, is schematically illustrated in Fig. 1b. Presently, the singulating device 10 serves for singulating a stack 12 of paper or cardboard sheets, which are to be referred to as sheets 14 in simplifying manner in the following. According to the embodiment, the singulating device 10 comprises two separating devices 24 arranged opposing each other, by means of which the stack 12 can be flown by a

gas flow 36, in particular an airflow, for singulating the sheets 14. For reasons of clarity, the gas flow 36 is only illustrated by an arrow in Fig. 2a.

From the synopsis of the figures 1a and 1b, one recognizes that two separating devices 24 are respectively retained at a distance x to each other at ends opposing each other, namely a first end 48 and a second end 50 of a retaining device 46 of the singulating device 10. This distance x at least substantially corresponds to an edge length of an edge 20 of the stack 12. In addition, the singulating device 10 comprises guiding elements opposing each other, namely a first guiding element 62 as well as a second guiding element 64, by means of which at least some of the sheets 14 of the stack 12 to be singulated can be aligned along a singulating direction 74. In Fig. 2c, an enlarged view of a circular area B marked in Fig. 1a, it is clearly apparent that the first guiding element 62 is configured as a guiding rail. At least the uppermost sheet 14, thus the sheet 14 resting on the stack 12 and farthest spaced from a base area 18 of the stack 12, can be aligned and guided on this guiding rail. In addition thereto, some of the sheets 14 lying below the uppermost sheet 14 can also be aligned and guided by means of the guiding rail. As is furthermore apparent from Fig. 2c, a stack height sensor 76 is arranged at the first guiding element 62, which presently emits two light beams 78. At the opposing second guiding element 64, a receiver 80 for detecting the light beams 78 is arranged. As soon as the beam path of the light beams 78 between the stack height sensor 76 and the receiver 80 is free, thus a sufficient number of the sheets 14 has been removed from the stack 12, this is detected by the receiver 80 and a relative movement between the stack 12 and the singulating device 10 is performed until the light beams 78 or the beam paths thereof are again covered by the uppermost sheets 14 of the stack 12. Thereby, it is ensured that the stack 12 is continuously fed in singulating, thus is moved vertically upwards in singulating and too large transport paths do not arise. In the present example, the feed is effected in that a pallet 22, on which the stack 12 rests, is lifted. In order to remove the respectively uppermost sheet 14 from the stack 12 corresponding to the singulating direction 74, the singulating device 10,

as shown in Fig. 1b, comprises a transport device 70 for lifting and moving the sheets 14 to be singulated.

Fig. 2a shows a schematic detailed representation of the singulating device 10 according to an area A indicated in Fig. 1a. One recognizes that the separating device 24 comprises aligning units 26, which are formed angled and are abutted on a corner area of the stack 12 and align it. For singulating the sheets 14 of the stack 12, the aligning unit 26 comprises first opening 32 formed as a passage opening, by which the corresponding area of the stack 12 can be flown by the gas flow 36. By means of the angled aligning units 26, the stack 12 is kept in position upon flowing by the gas flow 36. As is further apparent from Fig. 2a, the first opening 32 is arranged at a chamfer 31 of the angled aligning unit 26. In order to be able to particularly beneficially align the stack 12, the angled aligning unit 26 presently comprises two wall elements arranged perpendicular to each other for aligning the stack 12, namely a first wall element 28 and a second wall element 30. For example, the gas flow 36 flows over a compressed air port not illustrated here, which is connected to the first opening 32, through the angled aligning unit 26 to a corner area 16 of the stack 12, wherein this corner area 16 faces away from the base area 18 of the stack 12 on the pallet 22. In that the aligning unit 26 of the respective separating device 24 surrounds the corner area 16 of the stack 12 at least in certain areas, only a movement of the uppermost sheet 14 along the singulating direction 74 is allowed, whereas a movement of the uppermost sheet 14 into directions different therefrom is prevented by means of the angled aligning units 26 of the two separating devices 24 as well as by means of the two guiding elements 62, 64. The same also applies to sheets lying below the uppermost sheet 14, which are surrounded by the aligning units 26 and the guiding elements 62, 64 in certain areas.

The first opening 32 formed as a passage opening can for example be formed as a straight bore through the angled aligning unit 26 or, as illustrated in Fig. 2a and Fig. 2b, be realized by multiple bores within the angled aligning unit 26. Thus, in the illustrated embodiment, the first opening 32 is passed from the chamfer 31

through the first wall element 28 in the angled aligning unit 26, whereby at least a first partial flow 38 of the gas flow 36 presently enters the angled aligning unit 26 at the chamfer 31 facing away from the stack 12 and exits from it on a side of the first wall element 28 facing the stack 12. As is in particular apparent from Fig. 2b, the angled aligning unit 26 and thereby the separating device 24 comprises a second opening 34, by means of which the stack 12 can also be flown by the gas flow 36 for singulating the sheets 14, wherein the gas flow 36 can be divided into two partial flows by means of the first opening 32 and the second opening 34, namely the first partial flow 38, which is oriented to the stack 12 according to a first flow direction 42, and a second partial flow 40, which is oriented to the stack 12 according to a second flow direction 44. Therein, the first partial flow 38 flows from the first opening 32 and the second partial flow 40 flows from the second opening 34 towards the stack 12. Therein, the second opening 34 is configured as a passage opening just as the first opening 32. However, the second opening extends 34 through the second wall element 30 and is connected to the first opening 32 in gas conducting manner. This allows that the gas flow 36 can be divided into the first partial flow 38 and the second partial flow 40 in substantially identical mass flow portions within the angled aligning unit 26. By this division of the gas flow 36 into the first partial flow 38 and into the second partial flow 40, the stack can be particularly uniformly flown in its corner area 16. Furthermore, one recognizes that the flow directions preset by the openings 32, 34, thus the first flow direction 42 and the second flow direction 44 of the two partial flows 38, 40, intersect each other in an area behind the exit of the partial flows. At the point of intersection of the two partial flows 38, 40, they form a vertical flow 41, which arises between the sheets 14 of the stack 12 to be singulated from each other. This vertical flow 41 moves the sheets 14 in particularly powerful manner and far apart from each other, whereby a particularly thick air cushion forms between the sheets 14. Thereby, it is ensured in particularly efficient manner that always only one of the sheets 14 is respectively singulated by means of the transport device 70 or the vacuum suction cup 72 thereof, namely the uppermost sheet 14. In order to effectively prevent co-movement of the underling sheets 14, the singulating device 10 comprises a downholding device 66, by means of which the remaining

sheets 14 of the stack 12 are pressed down corresponding a downholding movement 68 directed in the direction of the base area 18.

In order to improve the formation of an air cushion between the sheets 14 to be singulated, the singulating device 10 comprises a vibrating device 52, by means of which pulses 54, 56, 58, 60, in particular mechanical force impacts, can be exerted on the stack. Therein, the first pulse 54 and the second pulse 56 are directed opposite to each other, wherein the third pulse 58 and the fourth pulse 60 are oriented in the same direction, which also corresponds to the singulating direction 74. Therein, it is clear that only one, two or three of the pulses 54, 56, 58, 60 can also be exerted on the stack 12 and not necessarily all of the pulses 54, 56, 58, 60. In the illustrated embodiment, the vibrating device 52 is arranged at the angled aligning unit 26. Therein, the vibrating device 52 presently includes two vibrator elements 53, of which respectively one is arranged at the first wall element 28 and one is arranged at the second wall element 30. The vibrator elements 53 each move in relation to the angled aligning unit 26 during the operation of the vibrating device 52 and therein exert the pulses or force impacts on the aligning unit 26 and on the sheets 14 of the stack 12 via it. Generally, a pulse variation is to be understood by a force impact, which results from the force on the sheets 14 supplied with pulses as well as the acting duration of the force. Due to the permanent relative movement of the sheets 14 supplied with pulses caused by the vibrator elements 53, the force on the sheets 14 is not constant, but varies, wherefore pulses 54, 56, 58, 60 of different strengths (non-constant pulses) are exerted by means of the vibrator elements 53.

Patentkrav

1. Skilleindretning (10) til at adskille en stabel (12) af papir- eller kartonark (14) med mindst en separator (24), med hvilken mindst en gasstrøm (36), især en luftstrøm, kan bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14), idet separatoren (24) har mindst en vinklet justeringsenhed (26) til justering af stablen (12) og mindst en som gennemgående åbning gennem den vinklede justeringsenhed (26) udformet første åbning (32), med hvilken gasstrømmen (36) kan bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14),

kendetegnet ved, at

den vinklede justeringsenhed (26) har mindst en anden åbning (34), med hvilken gasstrømmen (36) kan bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14), idet gasstrømmen (36) ved hjælp af den første åbning (32) og den anden åbning (34) kan opdeles i mindst to delstrømme (38, 40), som er rettet mod stablen (12), og idet den anden åbning (34) ligesom den første åbning (32) er udformet som gennemgående åbning.

2. Skilleindretning (10) ifølge krav 1,

kendetegnet ved, at

den vinklede justeringsenhed (26) har mindst to vinkelret på hinanden anbragte vægelementer (28, 30) til justering af stablen (12).

3. Skilleindretning (10) ifølge krav 1 eller 2,

kendetegnet ved, at

den vinklede justeringsenhed (26) i det mindste i områder omgiver et hjørne (16) af stablen (12), som vender bort fra et basisområde (18) af stablen (12).

4. Skilleindretning (10) ifølge et af de foregående krav,

kendetegnet ved, at

forudbestemte strømningsretninger (42, 44) af de to delstrømme (38, 40) gennem henholdsvis den første åbning (32) og den anden åbning (34) skærer hinanden.

5. Skilleindretning (10) ifølge et af de foregående krav,
kendetegnet ved, at
to separatorer (24) ved over for hinanden liggende ender (48, 50) af en holdeanordning (46) på skilleindretningen (10) holdes i en indbyrdes afstand (x), som i det mindste i det væsentlige svarer til en kantlængde af stablen (12).

6. Skilleindretning (10) ifølge et af de foregående krav,
kendetegnet ved, at
skilleindretningen (10) omfatter mindst en vibrationsanordning (52), med hvilken der kan udøves impulser (54, 56, 58, 60), især mekaniske stødimpulser, på stablen (12).

7. Skilleindretning (10) ifølge krav 6,
kendetegnet ved, at
vibrationsanordningen (52) er anbragt på den vinklede justeringsenhed (26).

8. Skilleindretning (10) ifølge et af de foregående krav,
kendetegnet ved, at
skilleindretningen (10) har styreelementer (62, 64), med hvilke i det mindste nogle af de papir- eller kartonark (14) fra stablen (12), der skal adskilles, kan justeres langs en skilleretning (74).

9. Skilleindretning (10) ifølge et af de foregående krav,
kendetegnet ved, at
skilleindretningen (10) har mindst en nedholdeindretning (66) til midlertidigt at holde stablens (12) papir- eller kartonark (14) nede.

10. Skilleindretning (10) ifølge et af de foregående krav,
kendetegnet ved, at
skilleindretningen (10) har en transportindretning (70) til at løfte papir- eller kartonark (14), der skal adskilles, og bevæge de papir- eller kartonark (14), der skal adskilles, i forhold til stablen (12).

11. Skilleindretning (10) ifølge krav 10,
kendetegnet ved, at

transportindretningen (70) har mindst en vakuumsuger (72) til at løfte de papir- eller kartonark (14), der skal adskilles.

12. Separator (24) til en skilleindretning (10) ifølge et af kravene 1 til 11, idet en gasstrøm (36), især en luftstrøm, ved hjælp af separatoren (24) kan bringes til at strømme til en stabel (12) for at adskille papir- eller kartonarkene (14) i stablen (12), idet

separatoren (24) til justering af stablen (12) har mindst en vinklet justeringsenhed (26) og en som gennemgående åbning gennem den vinklede justeringsenhed (26) udformet første åbning (32), med hvilken gasstrømmen (36) kan bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14),

kendetegnet ved, at

den vinklede justeringsenhed (26) har mindst en anden åbning (34), med hvilken gasstrømmen (36) kan bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14), idet gasstrømmen (36) ved hjælp af den første åbning (32) og den anden åbning (34) kan opdeles i mindst to delstrømme (38, 40), som er rettet mod stablen (12), og idet den anden åbning (34) er udformet som gennemgående åbning ligesom den første åbning (32).

13. Fremgangsmåde til at drive en skilleindretning (10), ved hvilken en gasstrøm (36), især en luftstrøm, kan bringes til at strømme gennem mindst en separator (24) på skilleindretningen (10) en stabel (12) for at adskille papir- eller kartonark (14) i stablen (12), idet papir- eller kartonarkene (14) justeres af mindst en vinklet justeringsenhed (26) på separatoren (24), og gasstrømmen (36) bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14) gennem en som gennemgående åbning gennem den vinklede justeringsenhed (26) udformet første åbning (32),

kendetegnet ved, at

den vinklede justeringsenhed (26) har mindst en anden åbning (34), med hvilken gasstrømmen (36) bringes til at strømme til stablen (12) for at adskille papir- eller kartonarkene (14), idet gasstrømmen (36) ved hjælp af den første åbning (32) og den anden åbning (34) opdeles i mindst to delstrømme (38, 40), som er rettet mod stablen (12), og idet den anden åbning (34) ligesom den første åbning

(32) er udformet som gennemgående åbning.

14. Fremgangsmåde ifølge krav 13,
kendetegnet ved, at
der, når gasstrømmen (36) bringes til at strømme til stablen (12) gennem den første åbning (32), endvidere af en vibrationsanordning (52) på skilleindretningen (10) udøves impulser (54, 56, 58, 60), især mekaniske stødimpulser, på stablen (12).

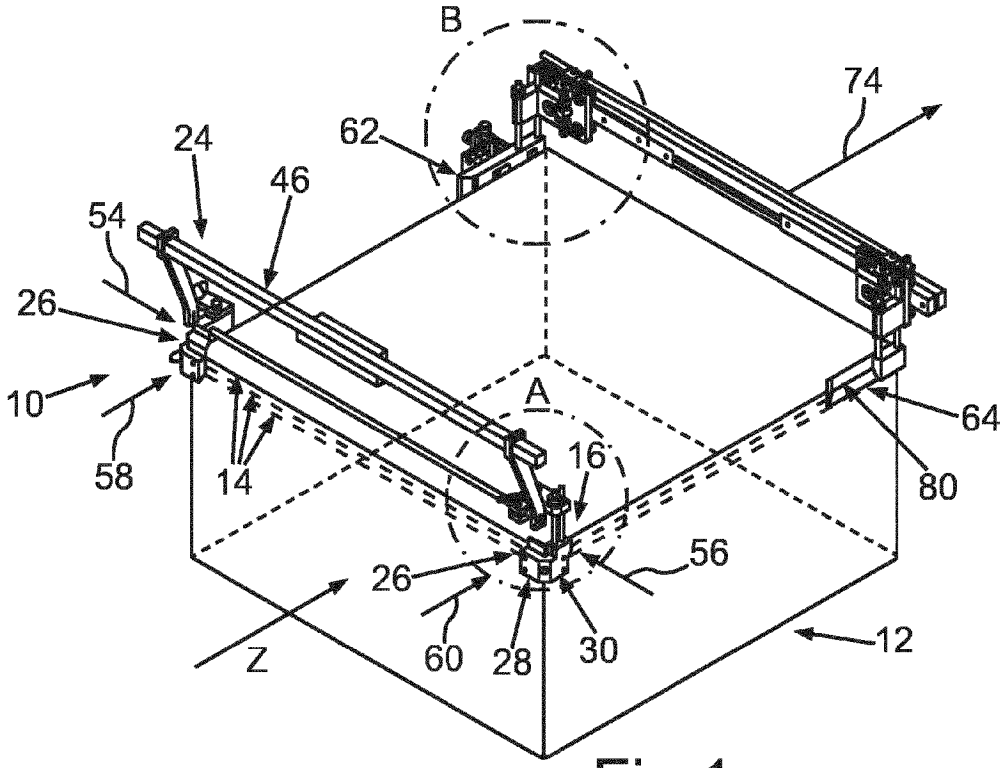
B
74
62
24
46
54
26
10
58
14
A
16
64
80
56
26
60
28
30
Z
12

Fig.1a

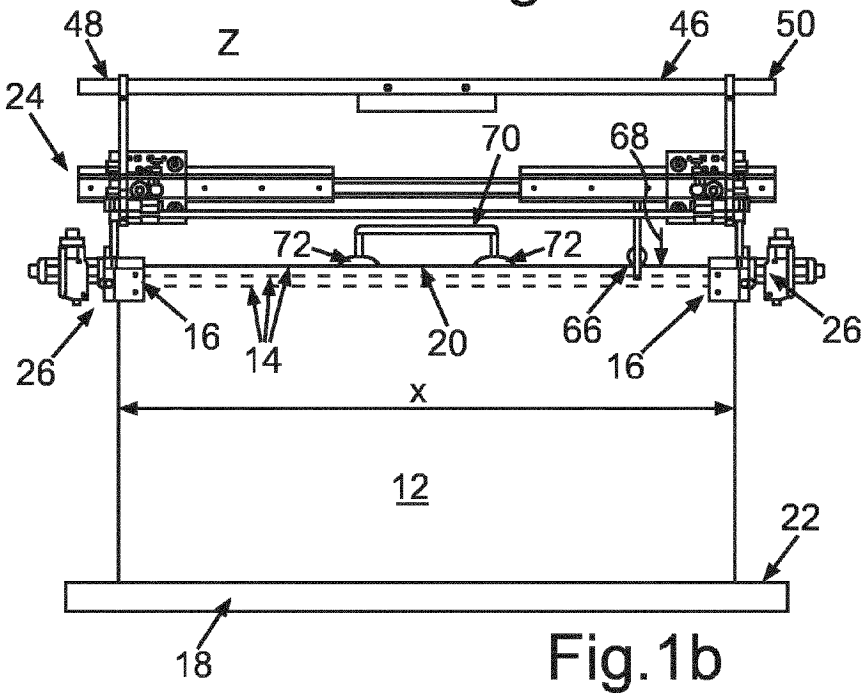
48
Z
46
50
24
70
68
72
72
16
14
20
66
16
26
26
x
12
22
18

Fig.1b

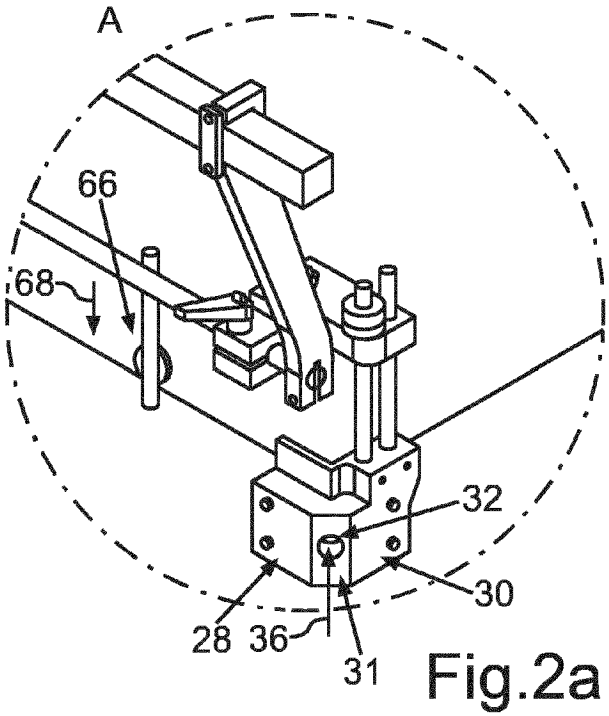

Fig.2a

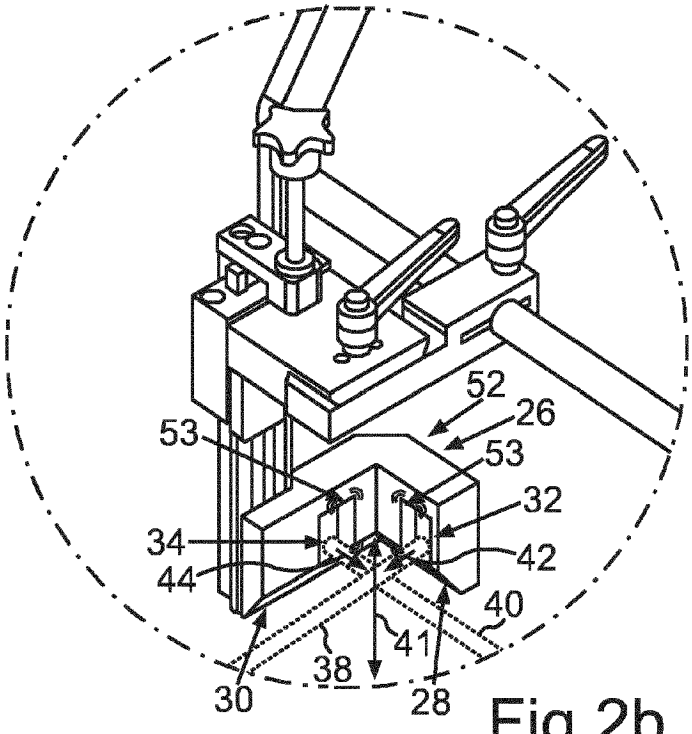

Fig.2b

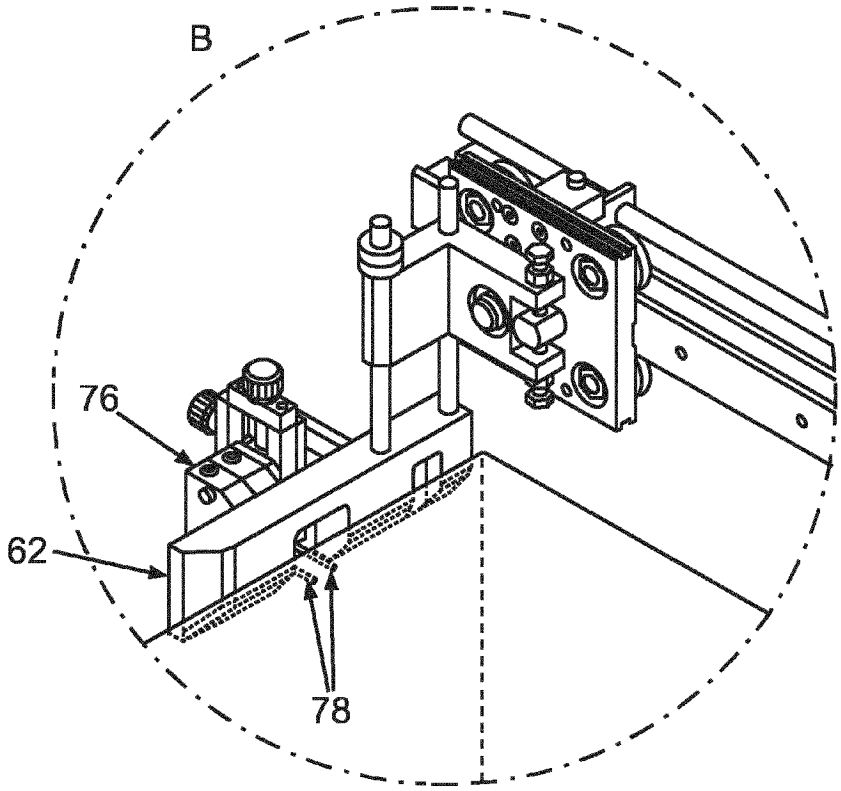

Fig.2c