The present invention relates to a turning apparatus and to an insert for a turning apparatus for at least two individual stacks (5 - 7) of individual sheets. The turning apparatus according to the invention, or the insert, is characterized by at least three stack-holding plates (1 - 4) to hold at least two individual stacks (5 - 7) separately between the stack-holding plates (1 - 4), in each case in stack-holding areas (19, 20) of the stack-holding plates (1 - 4), and by spacers (8) which are provided between adjacent stack-holding plates (1 - 4) and are arranged outside the stack-holding areas (19, 20).
PAPER STACK TURNING APPARATUS FOR INDIVIDUAL STACKS COMPRISING INDIVIDUAL SHEETS AND INSERT FOR SAME

[0001] The present invention relates to a turning apparatus for at least two individual paper stacks of individual sheets.

[0002] Turning apparatus into which a paper stack can be inserted and turned through 180 degrees by means of the turning apparatus are known. Turning apparatus of this type are used, for example, before the individual sheets are introduced into a printing machine, in order to be able to print sheets already printed on one side, on the other side. In addition, conventional turning apparatus are used to tilt the paper stack through 90 degrees so that the sheets are brought from a horizontal into a vertical position, in order to dry the paper in this position by means of ventilation. The drawback with the known turning apparatus is that they cannot be used in conjunction with printed paper sheets which are printed in the so-called rack printing process.

[0003] The rack printing process is used in particular when a large quantity of ink is applied during printing. In this case, the weight of a paper stack of normal size, which can be turned in conventional turning apparatus, is so great that smearing of the ink on the lower printed sheets would occur. For this reason, in the rack printing process, a paper stack of normal size is subdivided into a number of individual stacks, which are stored separately from one another by intermediate boards. The spacers used for the intermediate boards are, conventionally, angles which enclose the corners of each individual stack. Normally, following printing, the paper is dried lying horizontally in the individual stacks in this way. In the case of this type of storage, drying may last a number of hours.

[0004] The disadvantage with the conventional holding of the individual stack produced in the rack printing process is that turning or ventilating of the individual stacks stored in this way in a conventional turning apparatus is not possible, since after being turned, the vertical paper stacks would rest on the lower angle pieces. This would lead to damage to the paper. In addition, removal of the angles in this position is possible only with difficulty and would be associated with the risk of damage to the paper.

[0005] It is the object of the present invention to provide a turning apparatus and an insert for a turning apparatus with which at least two individual stacks comprising individual sheets can be turned without the sheets being damaged.

SUMMARY OF THE INVENTION

[0006] According to the invention, this object is achieved by a turning apparatus characterized by at least three stack-holding plates to hold at least two individual stacks separately between the stack-holding plates, in each case in stack-holding areas of the stack-holding plates, and by spacers which are provided between adjacent stack-holding plates and are arranged outside the stack-holding areas.

[0007] The advantage with the turning apparatus according to the invention is that the sheets in the individual stacks are not damaged when they are turned, since the individual stacks, as they are turned, are disposed only within the stack-holding areas of the stack-holding plates, and thus do not come into contact with the spacers. It is therefore possible for the turning apparatus according to the invention to be used in conjunction with paper sheets which are printed in the rack printing process and which are stored in relatively small individual stacks separated by intermediate plates. The stacks stored in this way can be turned with the turning apparatus according to the invention and can be ventilated with a ventilation system. By this means, the risk of impairing the quality during long storage times, or smearing of the printed sheets, is prevented. The faster drying which is possible with the turning apparatus according to the invention leads to an increase in productivity as a result of a considerable saving in time in the production passage time when printing the individual sheets.

[0008] The spacers are advantageously provided in the area of the corners of the stack-holding plates and fastened detachably to the latter. For this purpose, the stack-holding plates, at least on one of their sides outside the stack-holding areas, can consist of a ferromagnetic material or have ferromagnetic inserts, and the spacers can have magnets. Conversely, it is also possible for at least one end of the spacers to consist of a ferromagnetic material or to have ferromagnetic inserts, and for the stack-holding plates, at least on one side outside the stack-holding areas, to have magnets. By this means, the spacers can be fastened magnetically to the stack-holding plates. The advantage with this fastening of the spacers to the stack-holding plates is that it permits simple handling in which, after the tower, built up from the stack-holding plates and the spacers, has been pivoted into a vertical position, the spacers can be removed easily. At the same time, this embodiment permits simple manufacture of the stack-holding plates and the spacers, since no complicated fastening mechanism has to be provided.

[0009] According to one embodiment of the central stack-holding plate or the central stack-holding plates, this or these is or are hollow and provided with a gas inlet opening, and with gas outlet openings in the stack-holding area. The gas outlet openings are advantageously provided on both sides of the stack-holding plates. This embodiment makes it possible, after the stack-holding plates have been pivoted into a vertical position, for air, for example, to be blown in through the gas inlet opening into a cavity in the stack-holding plates, and to emerge through the gas outlet openings. By this means, an air cushion is formed between the stack-holding plate and the adjacent sheets on both sides of the stack-holding plate, so that the stack-holding plate can easily be removed without sheets being pulled out with it.

[0010] The turning apparatus advantageously has a gripping device to hold the stack-holding plates that are held apart by the spacers, it being possible for the stack-holding plates held apart by the spacers to be moved out of the gripping device and moved into it. In addition, the turning apparatus advantageously has a pivoting device, with which the stack-holding plates held by the gripping device can be pivoted at least from a horizontal position into a vertical position, it being possible for the central stack-holding plates to be removed when in the vertical position. Holding the stack-holding plates in a gripping device makes it possible to use the stack-holding plates held apart by the spacers in conjunction with a conventional turning apparatus.

[0011] In addition, the turning apparatus according to the invention advantageously has a ventilating device for drying
the individual sheets, the ventilating device also permitting air to be blown into the cavities in the central stack-holding plates. The ventilation of the sheets of the individual stacks held by the turning apparatus permits very fast drying of freshly printed sheets. In addition, powder residues are blown out at the same time during the ventilation operation. This is associated with considerable advantages for further processing, since the printing rolls and rubber blankets of the printing machines have to be cleaned less often, and the knives in the cutting machines have to be changed less often. In this way, machine running times are advantageously prolonged.

[0012] The insert according to the invention for a turning apparatus is characterized by at least three stack-holding plates for holding at least two individual stacks separately between the stack-holding plates, in each case in stack-holding areas of the stack-holding plates, and by spacers which are provided between adjacent stack-holding plates and are arranged outside the stack-holding areas. The advantage of the insert is that it can be used in connection with conventional turning apparatus. In this case, the insert is moved into the turning apparatus and held by the gripping device of the latter. The insert therefore makes it possible to use conventional turning apparatus even in connection with paper sheets printed by the rack printing process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the following text, a preferred embodiment of the turning apparatus according to the invention and of the insert for a turning apparatus will be explained in detail with reference to the appended drawings, in which:

[0014] FIG. 1 shows in schematic form, a front elevational view of the stack-holding plates 1 - 4 held apart by spacers 8 with individual stacks 5 - 7 held between them,

[0015] FIG. 2 shows, in schematic form, a turning apparatus according to the invention, in which the tower shown in FIG. 1 and formed by the stack-holding plates 1 - 4 and the spacers 8 is held in a position pivoted through 90 degrees, and

[0016] FIG. 3 shows, in schematic form, the plan view of a stack-holding plate 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] The turning apparatus according to the invention has a pivoting device 12 and a gripping device having a lower and an upper gripper 10, 11. In addition, the turning apparatus has a ventilating device (not shown) for drying the sheets held by the turning apparatus. A turning apparatus of this type is described in the German Utility Model G9420896.4, to which reference is made. The device described therein includes a turning apparatus for stacks of individual sheets including a rotating and tilting device and having at least a lower and upper gripper and a ventilating nozzle. The ventilating nozzle is drivenly mounted on the rotating and tilting device between the upper and lower grippers and along the stacks. Further, the ventilating nozzle includes at least one ionization rod, situated to ionize the stream of air.

[0018] As FIGS. 1 and 2 show, an insert in the form of a tower 18 is held by the grippers 10, 11 of the turning apparatus. This insert or tower can, in particular, even be used in connection with conventional turning apparatus. In the preferred embodiment shown here, the tower 18 comprises four stack-holding plates 1 - 4, between which three paper stacks 5 - 7 are held. According to other configurations of the invention, a higher or lower number of stack-holding plates can also form the tower 18, provided at least two individual paper stacks can be held. At least three stack-holding plates are therefore needed. It is possible for either or both of the outermost plates of the turning apparatus (14) to be formed by the grippers 10, 11 of the turning apparatus.

[0019] The stack-holding plates 1 - 4 are held apart from one another by spacers 8. The individual stacks with printed paper sheets, for example produced by the rack printing process, are held between the stack-holding plates 1 - 4. Fastened to the lowest stack-holding plate 4 are rollers 9, so that the tower 18 can be moved into and out of the gripping device 10, 11 of the turning apparatus.

[0020] FIG. 3 shows the plan view of a stack-holding plate, for example the central plate 2. The stack-holding plates 1 - 4 have a so-called stack-holding area, on which or, in the case of a vertical position of the stacks and plates, adjacent to which the individual stacks comprising the sheets can be arranged in the turning apparatus. This stack-holding area is composed of the inner area 19 divided off by the dashed lines, and the four outer areas 20 adjacent thereto. This means that only the four corner areas of the stack-holding plates 1 - 4 are removed from the stack-holding area 19, 20. In the initial position, the individual stacks 5 - 7 are placed on the inner area 19 of the upper sides of the stack-holding plates 2 - 4. The stack-holding plates 1 - 4 are then put together, with the spacers 8 between them, to form the tower 18. The spacers which hold two adjacent stack-holding plates 1 - 4 apart from each other, are arranged outside the stack-holding areas 19, 20. They are provided in the comer areas 14.

[0021] In order to fasten the spacers 8 in the comers of the stack-holding plates 1 - 4, the upper sides of the stack-holding plates 2 - 4 have ferromagnetic inserts 14, and the spacers 8 have permanent magnets in their undersides. By this means, the spacers 8 are detachably fastened magnetically to the stack-holding plates 2 - 4. Alternatively or additionally, such a magnetic fastening can also be formed by inserts in the undersides of the stack-holding plates 1 - 3 and permanent magnets in the upper sides of the spacers 8.

[0022] The tower 18 formed in this way, or the insert for a turning apparatus, can be moved into the gripping device 10, 11 of the turning apparatus. By means of the pivoting device 12, the tower 18 then located in the gripping device 10, 11 can be pivoted from a horizontal position into a vertical position as shown in FIG. 2. In addition, rotation of the tower 18 is also possible, if the pivoting device permits pivoting through 180 degrees or even tilting and rotating movements. As they are pivoted, the individual stacks 5 - 7 are displaced downwards in the direction of the arrows shown in FIG. 2, until they rest on the stop 13 of the turning apparatus. During such displacements of the positions of the individual stacks 5 - 7, the latter always remain in the area of the stack-holding areas 19, 20, so that they cannot come into contact with the spacers 8 fastened to the metal inserts 14. This ensures that no damage to the sheets can occur during pivoting and, if appropriate, also during rotation of the individual stacks 5 - 7.
[0023] A further special feature, in particular of the central stack-holding plates 2, 3, is that they are hollow. A gas, for example air, can be blown into the cavity via gas inlet openings 16 and is then blown out through the gas outlet openings 15 preferably distributed on both sides of the stack-holding plates, within the stack-holding area 19, 20. When the stack-holding plates 2, 3 have been pivoted in the turning apparatus into a vertical state, as shown in FIG. 2, the said plates can be removed. For this purpose, the spacers 8 are removed first. Air is then blown into the gas inlet openings 16 by the ventilating device (not shown), so that this air emerges from the gas outlet openings 15. By this means, an air cushion is produced between the central stack-holding plates 2 and 3 and the adjacent sheets arranged on the right and left thereof. This makes it particularly easily possible to pull out the central stack-holding plates 2 and 3 by means of the recessed handles 17, without sheets being pulled out at the same time.

[0024] While versions of the present invention have been shown in detail, various modifications and improvements thereon will become rapidly apparent to those skilled in the art. Accordingly, the spirit and scope of the present invention is to be limited only by the following claims.

What is claimed is:

1. A turning apparatus for at least two individual stacks of individual sheets, comprising:
   (a) at least three stack-holding plates, including at least a first central stack holding plate, to hold at least two individual stacks separately between respective pairs of said stack-holding plates, in respective stack-holding areas of the stack-holding plates;
   (b) spacer means, said spacer means disposed between adjacent stack-holding plates, said spacer means positioned outside the stack-holding areas.

2. The turning apparatus according to claim 1, wherein said spacer means are positioned in the area of the corners of the stack-holding plates.

3. The turning apparatus according to claim 1, wherein said spacer means can be fastened detachably to the stack-holding plates.

4. The turning apparatus according to claim 2, wherein said spacer means can be fastened detachably to the stack-holding plates.

5. The turning apparatus according to claim 1, wherein said stack-holding plates, in, at least, a portion of the area outside the stack-holding areas, includes ferromagnetic material means, and wherein said spacer means includes magnet means, so that the spacer means can be fastened magnetically to the stack-holding plates.

6. The apparatus according to claim 1 wherein at least one end of said spacer means includes ferromagnetic material means, said stack-holding plates, in, at least, a portion of the area outside said stack-holding areas, including magnet means, so that the spacer means can be fastened magnetically to the stack-holding plates.

7. The turning apparatus according to claim 1, wherein said at least said first central stack-holding plate includes a hollow cavity and a gas inlet opening means, and further including a gas outlet opening means in a respective stack-holding area, said gas inlet opening means, hollow cavity and gas outlet opening means communicatively connected, whereby gas may pass in through said inlet opening means, through said cavity and out through said outlet opening means.

8. The turning apparatus according to claim 7, characterized in that said gas outlet opening means is provided on both sides of said at least one of said stack-holding plates.

9. The turning apparatus according to claim 1, further including a gripping device to hold said stack-holding plates that are held apart by spacer means, said stack-holding plates, held apart by the spacer means, movable into and out of said gripping device.

10. The turning apparatus according to claim 9, further including a pivoting device, such that said stack-holding plates held by said gripping device can be pivoted at least from a horizontal position into a vertical position, said at least said first central stack holding plate removable from said turning apparatus when said gripping device is in, at least, the vertical position.

11. The turning apparatus according to claim 1, further including a ventilating device for drying the individual sheets.

12. The turning apparatus according to claim 7, further including a ventilating device, said ventilating device adapted to connect to said gas inlet opening means whereby a gas can be blown through said gas inlet opening means and said cavity and out through said gas outlet opening means.

13. The turning apparatus according to claim 8, further including a gripping device to hold said stack-holding plates that are held apart by spacer means, said stack-holding plates, held apart by the spacer means, movable into and out of said gripping device.

14. The turning apparatus according to claim 13, further including a pivoting device, such that said stack-holding plates held by said gripping device can be pivoted at least from a horizontal position into a vertical position, said at least said first central stack holding plate removable from said turning apparatus when said gripping device is in, at least, the vertical position.

15. An insert for a turning apparatus for turning at least two individual stacks having individual sheets, comprising:
   (a) at least three stack-holding plates, including at least a first central stack-holding plate, to hold at least two individual stacks separately between respective pairs of said stack-holding plates, in respective stack-holding areas of the stack-holding plates; and,
   (b) spacer means, said spacer means disposed between adjacent stack-holding plates, said spacer means positioned outside the stack-holding areas.

16. The turning apparatus according to claim 15, wherein said spacer means can be magnetically fastened detachably to the stack-holding plates.

17. The turning apparatus according to claim 16, wherein said at least said first central stack-holding plate includes a hollow cavity and a gas inlet opening means, and further including a gas outlet opening means in a respective stack-holding area, said gas inlet opening means, hollow cavity and gas outlet opening means communicatively connected, whereby gas may pass in through said inlet opening means, through said cavity and out through said outlet opening means.

18. The turning apparatus according to claim 17, characterized in that said gas outlet opening means is provided on both sides of said at least one of said stack-holding plates.
19. The turning apparatus according to claim 18, further including a gripping device to hold said stack-holding plates that are held apart by said spacer means, said stack-holding plates, held apart by said spacer means, movable into and out of said gripping device.

20. The turning apparatus according to claim 19, further including a pivoting device, such that said stack-holding plates held by said gripping device can be pivoted at least from a horizontal position into a vertical position, said at least said first central stack-holding plate removable from said turning apparatus when said gripping device is in, at least, the vertical position.

* * * * *