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(54) Diverting device for folded fascicles

(57) A sheering device (1) for folded fascicles (2) is disclosed comprising comb-shaped sheering means (3) adapted to assume a lifted position and a lowered position with respect to the advancement path of the fascicles (2) in order to sheer the fascicles (2) towards two respective downstream paths, where the comb-shaped sheering means (3) are driven by cams (5) to their two operating positions. The sheering device (1) is further equipped with at least one motor (7) of a type with alternate current and digital vector control, that is adapted to automatically select one of said cams (5) and drive the selected cam (5) according to the upstream advancement speed of a system (9) for folding said fascicles (2). In this way, only two cams (5', 5'') are used for applications needing three operating ratios.

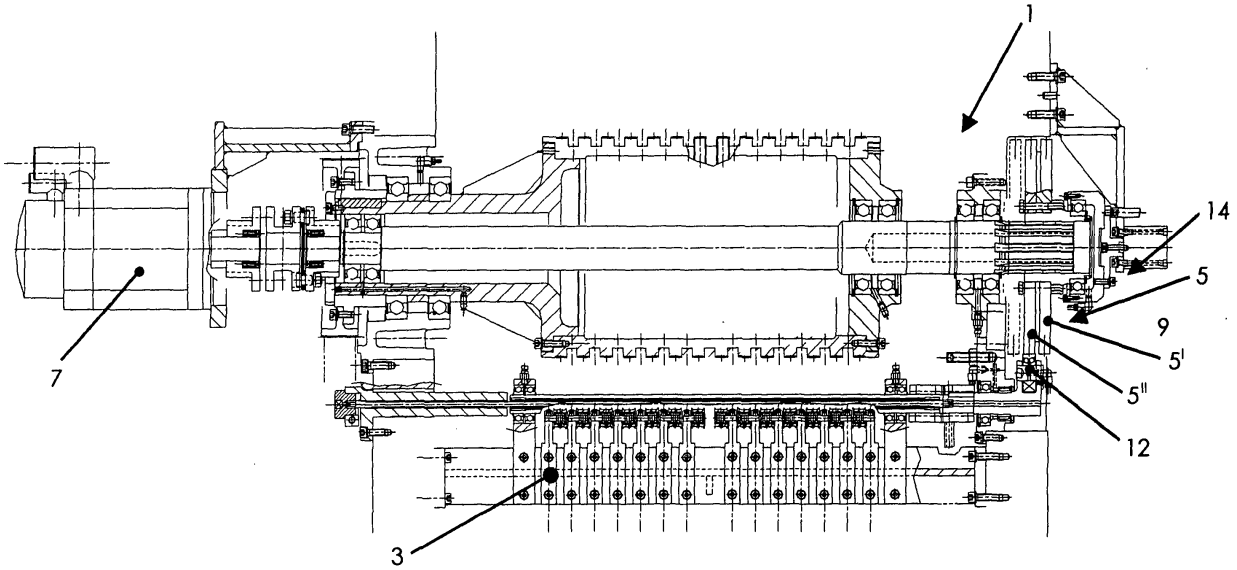

Fig. 2

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Description

[0001] The present invention refers to a sheering device for folded fascicles, to be used particularly downstream and in cooperation with paper-folding machines, in turn employed in rotary printing lines, for example for newspapers, magazines, books, etc.

[0002] The currently known sheering devices allow routing the paper fascicles folded as output from the folding machine towards collecting devices, commonly called "spiders", that are equipped with a plurality of wings spirally arranged on the surface of a cylinder, the fascicles being each housed between two following wings. Since such collecting devices can be found in a line in a number usually varying from one to three, according to the applications, it is necessary to route the folded fascicles one on each of the collecting devices, or two on a first device and one on a second device, etc., as will be better shown herein below.

[0003] In order therefore to be able to adequately route the fascicles towards the provided collecting device, the sheering device 1 is equipped with comb-shaped sheering means 3 that can assume: 1) a lifted position with respect to the advancement path of the fascicles 2, in which case the first folded fascicle 2 that reaches the sheering device 1 passes below the comb-shaped sheering means 3 and is routed towards the collecting device 20 immediately downstream of the affected sheering device 1; or 2) a lowered position that is substantially parallel to the advancement path of the fascicles 2, in which case the first folded fascicle 2 that reaches the sheering device 1 passes above the comb-shaped sheering means 3 and advances towards a following sheering device 1 in which it can be either routed towards its respective collecting device 20, or still to a following sheering device 1, and so on.

[0004] The comb-shaped sheering means 3, in a known way, assume their two operating positions due to the drive of a small roller 12 that cooperates with a cam 5 in order to push the comb-shaped sheering means 3 downwards, while the cam 5 itself, when it does not cooperate with the small roller 12, pushes the comb-shaped sheering means 3 upwards.

[0005] Figures 5 to 12 schematically show a possible series of combinations in which different types of fascicles 2, starting from a cylinder 6 downstream of the folding machine 8, must be routed towards the different collecting devices 20: in order to obtain these combinations, the currently known sheering devices must be equipped with three different types of cams, a first type being a cam that works every 180° of its rotation, a second type being a cam that works every 120° of its rotation and a third type being a cam that works every 90° of its rotation, since it is a cam of the first type that rotates at a speed that is half of the speed of the first type of cam.

[0006] Fig. 5 to 8 shown four possible cases in which the first type of cam is used: in particular, Fig. 5 shows the case in which fascicles 2 of type A are routed towards a collecting device 20 and fascicles 2 of type B are routed towards another collecting device 20. Fig. 6 shows a similar case, with fascicles 2 of types a, b, c, d and their collection combination a, c on a collecting device 20, and b, d on another collecting device 20. Fig. 7 shows a similar case, with fascicles 2 of types A, B, C and their collection combination A, C, B on a collecting device 20, and always A, C, B on another collecting device 20. And Fig. 8 shows a similar case, with fascicles 2 of types A, B, C one inside the other and their collection combination A, B, C on a collecting device 20, and always A, B, C on another collecting device 20.

[0007] Fig. 9 instead shows the case in which the second type of cam is used, to route fascicles 2 of three types A, B, C respectively towards three different collecting devices 20. Fig. 10 instead shows the case in which the second type of cam is always used, to route fascicles 2 of three types A, B, C, in which type A goes to a collecting device 20 and types B and C go to another collecting device 20.

[0008] Finally, Fig. 11 shows the case in which the third type of cam is used, to route fascicles 2 of two types A and B inserted one inside the other respectively in two collecting devices 20. And Fig. 12 instead shows the case in which the third type of cam is used to route fascicles 2 of types a, b, c, d respectively towards two collecting devices 20 with a and b inserted one inside the other in a device, and c and d inserted one inside the other in the other device.

[0009] Obviously the above-described cases are only some of the possible cases that can occur when working fascicles, being one able to use different cams or combinations of cams to obtain other types of arrangements.

[0010] Therefore, in order to be able to work with one of the three cams, the known sheering devices provide that the small roller 12 driving the comb-shaped sheering means 3 is manually moved, through an horizontal translation, next to the operating cam: this implies that an operator must access the machine interior in an uncomfortable and dangerous position, must unscrew an holding lever (not shown), move the small roller 12 and screw the holding lever again, all this with obvious practical problems, regarding machine stops and operating accuracy, since such operation is often a source of mistakes.

[0011] A solution to such problem, in order to do without this manual operation, has been the one of performing a mechanical movement of the small roller 12 through a screw that is adapted to move into four positions for its contact with the three different cams: this operation anyway does not solve other problems of the sheering device, such as for example the compulsory presence of three cams, when two of them would suffice for certain applications and, above all, a mechanical construction, namely a complex and costly construction subjected to operating problems, such as for example the complex procedures to synchronise the device with the fascicle-folding machine placed upstream.

[0012] Object of the present invention is solving the

prior art problems, by providing a sheering device that is controlled in order to always remain perfectly synchronised with the upstream folding machine, though being able to assume varying operating conditions, and be able to perform all its operations in a wholly automated way.

[0013] Another object of the present invention is providing a sheering device of the above mentioned type that is equipped with pneumatic means for selecting the operating modes of the driving small roller, allowing to automate with low costs also this type of operation.

[0014] The above and other objects and advantages of the invention, as will appear from the following description, are obtained by a sheering device as claimed in Claim 1. Preferred embodiments and non-trivial variations of the present invention are claimed in the sub-claims.

[0015] The present invention will be better described herein below by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 is a side schematic view of a folding machine with sheering devices of the invention and with downstream collecting devices;
- Figure 2 is a detailed side view of the sheering device of the invention;
- Figure 3 is a front view of the sheering device of Fig. 2;
- Figures 4 and 4a are detailed views of the small roller driving part; and
- Figures 5 to 12 are schematic views that show various possible applications of the prior art sheering device, also realised by the sheering device of the invention with two cams only instead of three.

[0016] With reference to the Figures, a preferred embodiment of the sheering device 1 of the present invention will be described, applied to the routing of folded fascicles of newspapers, but obviously the present invention can be used in all machines, and in particular in rotary printing machines, in which it is necessary to route objects that move in a row along a pre-established path.

[0017] A first innovative characteristic of the sheering device 1 of the invention is that it is equipped with at least one motor 7 of the type with alternate current and digital vector control, that is therefore able to keep a rotating movement that is perfectly synchronous with the other parts of the machine and to assume predetermined starting positioned with absolute accuracy: such motor 7 is adapted to automatically select the cams 5 and to drive the selected cam 5 according to the upstream advancement speed of the system 9 for folding the fascicles 2. In this way, a synchronism is realised between sheering device 1 and folding system 9 and the desired and in-phase routing of fascicles 2 on downstream collecting devices 20 is allowed. The motor 7 operates in a known way, being controlled by a computer connected to an encoder that provide at any time information related to the position of fascicles 2, in order to put the components of the system as a whole in phase one with the other.

[0018] The second characteristic of the sheering device 1 of the invention is providing, for performing the above described operations shown in Fig. 5 to 12, two cams 5', 5" only instead of the three cams used conventionally: the first cam 5' is adapted to realise two operating ratios while the second cam 5" is adapted to realise one operating ratio. This is made available by the construction of the whole system and by the presence of the motor 7: the first cam 5', in the practical case being examined, turns at a pitch of 180° with two different speeds, one speed being twice the other speed, in order to perform one driving stroke every 180° of each of its turns and one driving stroke every 90° of each of its turns depending on the application and according to the selected one of its two speeds.

[0019] The second cam 5" instead normally turns at a pitch of 120° in order to perform one driving stroke every 120° of each of its turns.

[0020] It is obviously possible to provide for a number of cams 5 that is greater than two, but in this case, due to the arrangement of the inventive system, it will be possible to realise a number of application combinations that is much greater than the one that can be realised, for example, with the conventional arrangement with three cams.

[0021] The inventive sheering device 1 is further equipped with a device 11 for pneumatically driving the small roller 12 that actuates the comb-shaped sheering means 3 in order to lift and lower the small roller 12 making it go away from and approach the cams 5.

[0022] Cooperating with the device 11, the sheering device 1 is further equipped with a device 14 for pneumatically driving the group of cams 5 in order to move, through an horizontal translation, the cam to be activated next to the lifted small roller 12. With the above-mentioned devices 11 and 14, it is thereby possible to realise a "cam exchange" operation on the operating small roller 12 that can be completely automatic, or that needs the presence of an operator in terms of absolute safety, being it simply necessary to drive the pneumatic devices 11 and 14 remotely. This is again made possible by the presence of the novel system with two cams, since the two operating positions involving cam + small roller can be reached with a pneumatic drive of the piston type that operates between its two common positions located at the end of its strokes, such positions corresponding to the positions in which the small roller 12 will get in contact with one of the two cams 5 that has been selected for working.

[0023] The above-described sheering device 1, in its most efficient use, is adapted to be placed in a global system for folding and collecting fascicles 2 like the one schematically shown in Fig. 1. Such system comprises at least one system 9 for folding the fascicles 2, at least one sheering device 1 connected downstream of the folding system 9, and at least two collecting devices 20 of

the fascicles 2 connected downstream of the sheering device 1. Fig. 1 instead shows the case in which there are two sheering devices 1 with three collecting devices ("spiders") 20 downstream.

[0024] The inventive device thereby allows doing without the mechanical members composing the kinematic chain for driving the cams and doing without at least one cam (using two cams instead of the three necessary cams in the prior art), or using a number of cams that is greater than two, that allow realising a much greater number of final application arrangements.

[0025] Moreover, the inventive device allows automating both the small roller movement, and the cam driving in order to synchronise the sheering device movements with the upstream folding machine movements, thereby realising a safe and reliable system with reduced costs.

Claims

1. Sheering device (1) for folded fascicles (2) comprising comb-shaped sheering means (3) adapted to assume a lifted position and a lowered position with respect to the advancement path of the fascicles (2) in order to sheer the fascicles (2) towards two respective downstream paths, said comb-shaped sheering means (3) being driven by cams (5) to their two operating positions, **characterised in that** the device (1) is further equipped with at least one motor (7) of a type with alternate current and digital vector control, said motor (7) being adapted to automatically select one of said cams (5) and drive said selected cam (5) according to the upstream advancement speed of a system (9) for folding said fascicles (2).

2. Sheering device (1) according to Claim 1, **characterised in that** said cams (5) are two (5', 5"), one cam (5') being adapted to realise two operating ratios and the other cam (5") being adapted to realise one operating ratio.

3. Sheering device (1) according to Claim 2, **characterised in that** said cam (5') turns at a pitch of 180° with two different speeds, one speed being twice the other speed, in order to realise one driving stroke every 180° of each of its turns or one driving stroke every 90° of each of its turns depending on its chosen speed.

4. Sheering device (1) according to Claim 2 or 3, **characterised in that** said cam (5") turns at a pitch of 120° in order to realise one driving stroke every 120° of each of its turns.

5. Sheering device (1) according to Claim 1, **characterised in that** the number of said cams (5) is greater than two, every cam being adapted to realise at least one operating ratio.

6. Sheering device (1) according to Claim 1, **characterised in that** it is further equipped with a device (11) for pneumatically driving the small roller (12) for actuating said comb-shaped sheering means (3) in order to lift and lower said small roller (12) making it go away from and get in operating contact with said cams (5).

7. Sheering device (1) according to Claim 1 or 7, **characterised in that** it is further equipped with a device (14) for pneumatically driving said group of cams (5) in order to move, through an horizontal translation, the cam to be activated next to said lifted small roller (12).

8. System for folding and collecting fascicles (2), comprising at least one system (9) for folding the fascicles (2), at least one sheering device (1) according to any one of Claims 1 to 7 connected downstream of said folding system (9), and at least two collecting devices (20) for the fascicles (2) connected downstream of said sheering device (1).

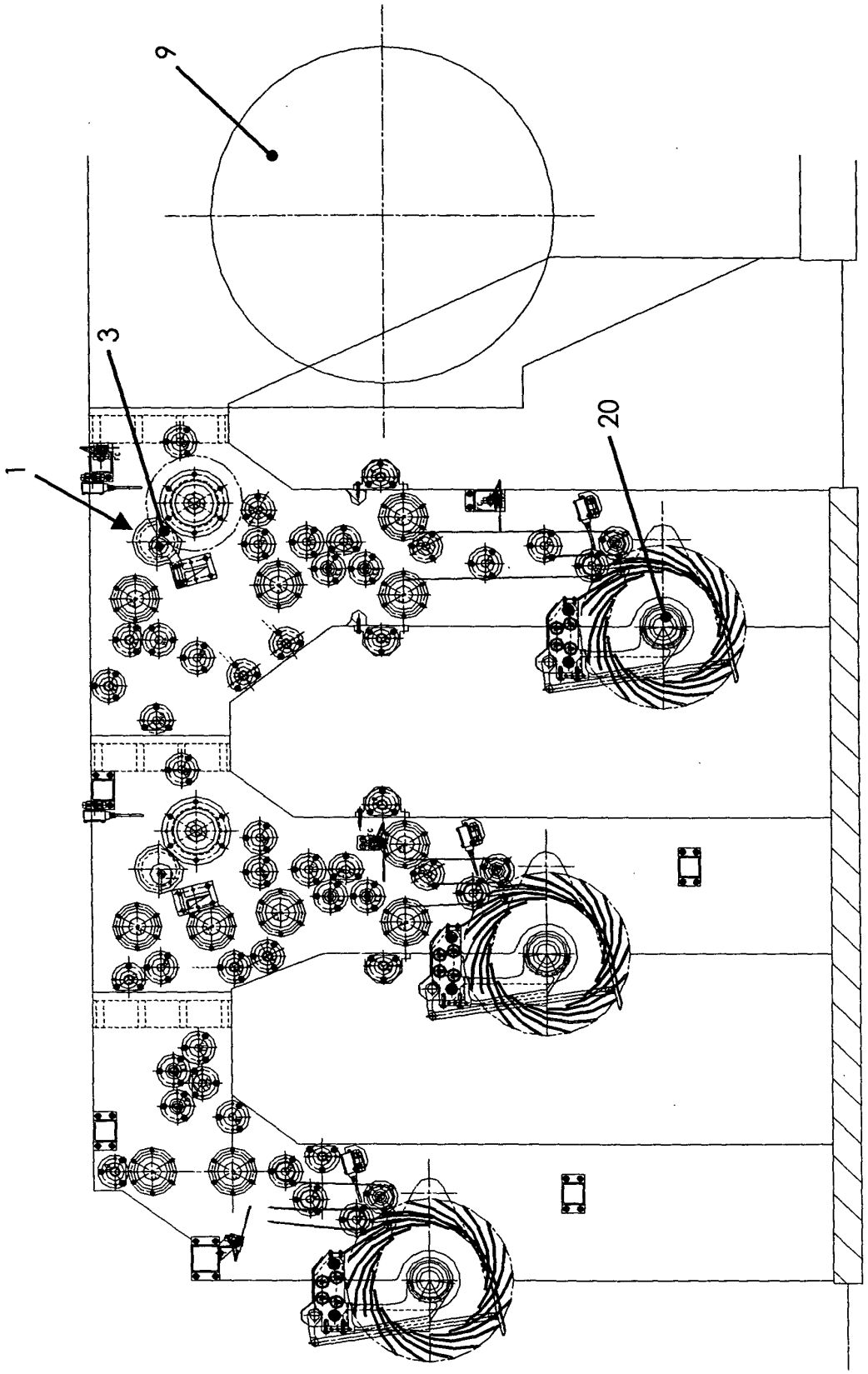

Fig. 1

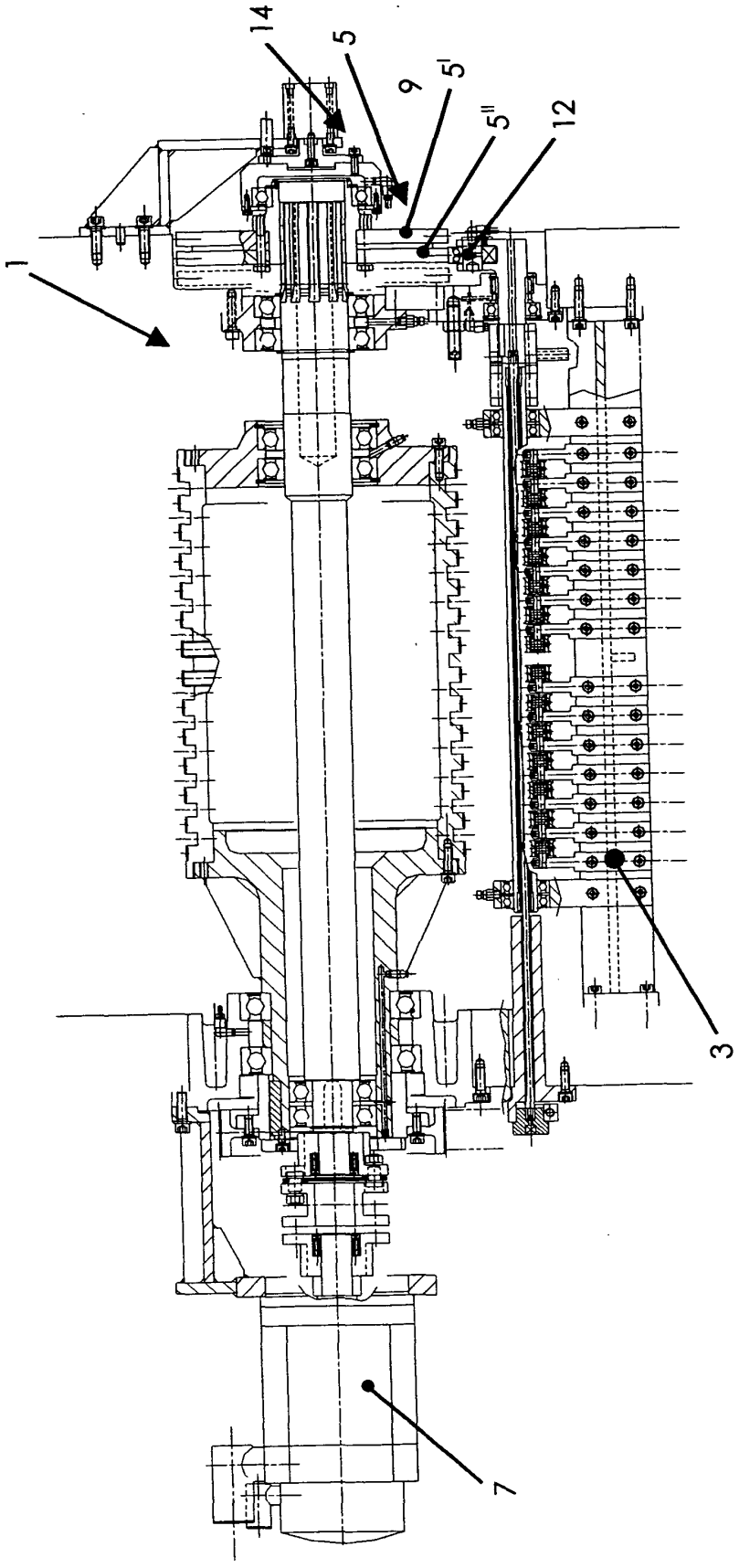

Fig. 2

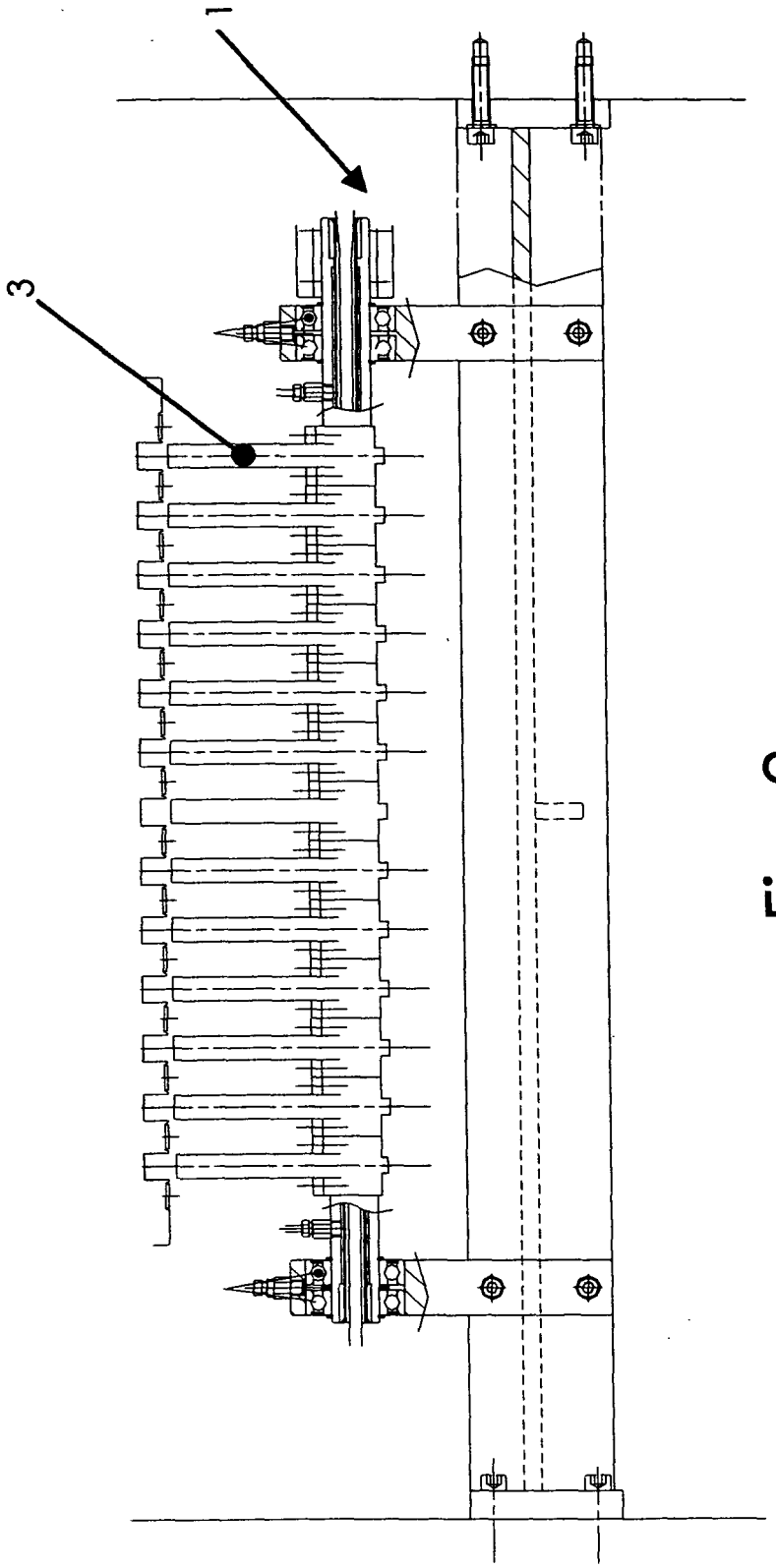

Fig. 3

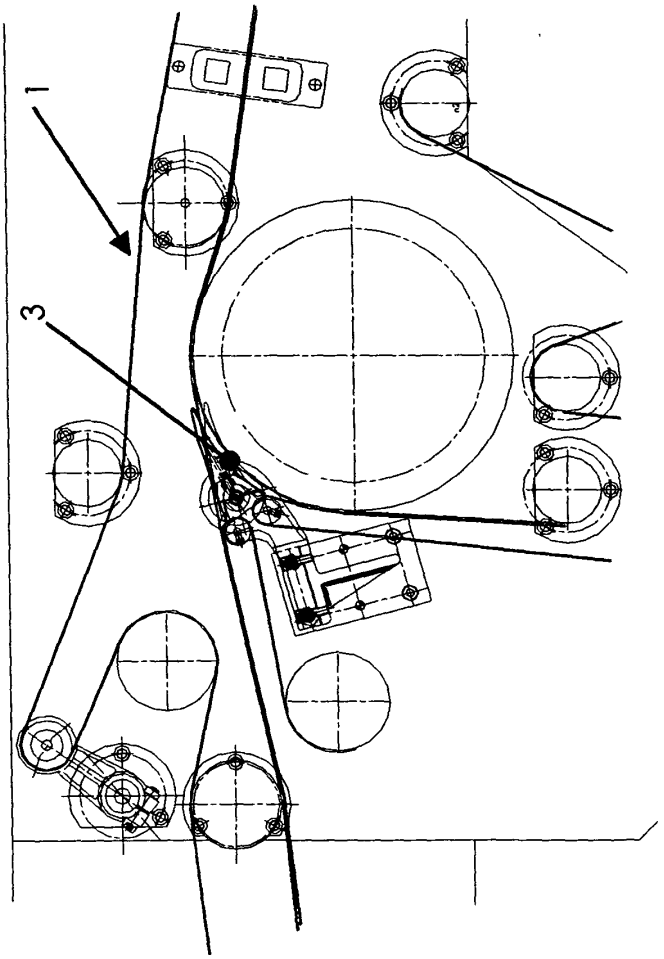

Fig. 4

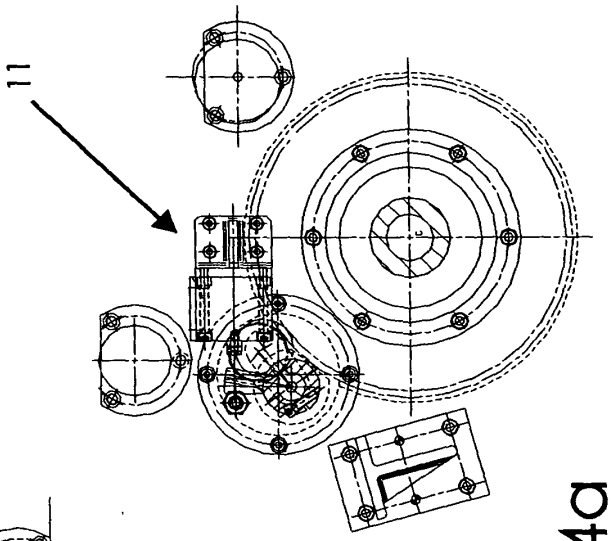

Fig. 4a

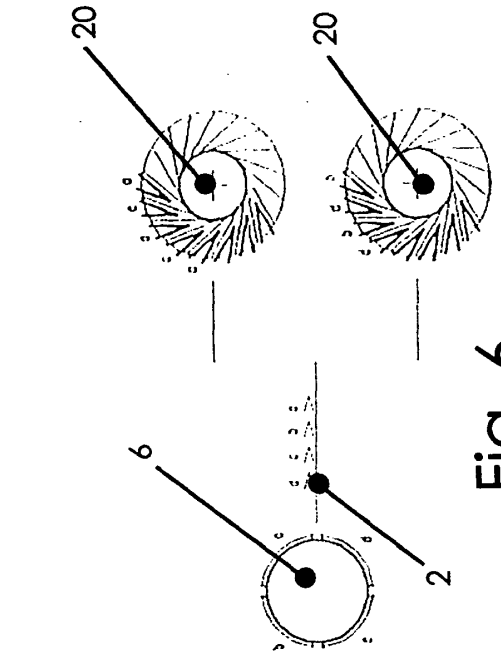

Fig. 6

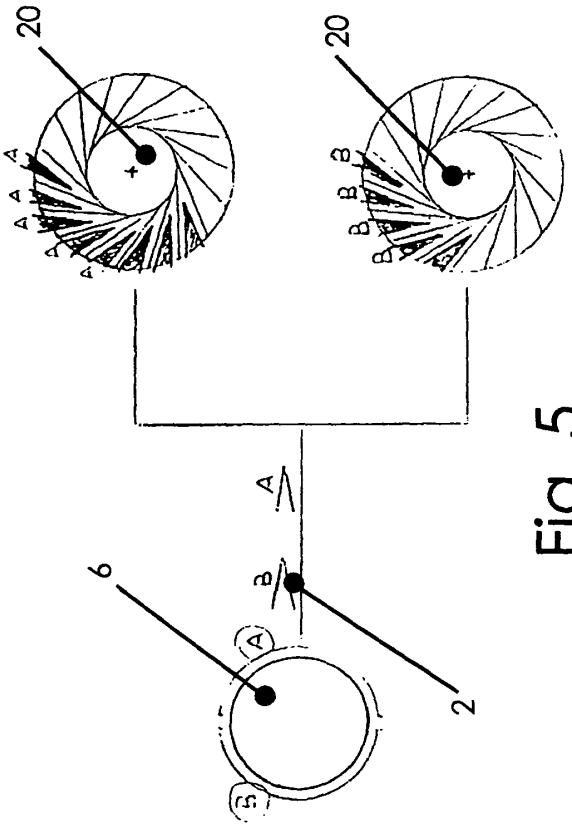

Fig. 5

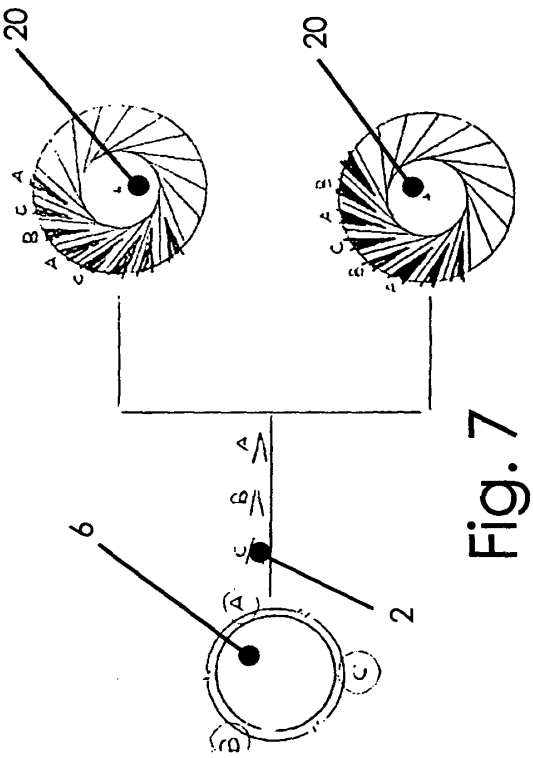

Fig. 7

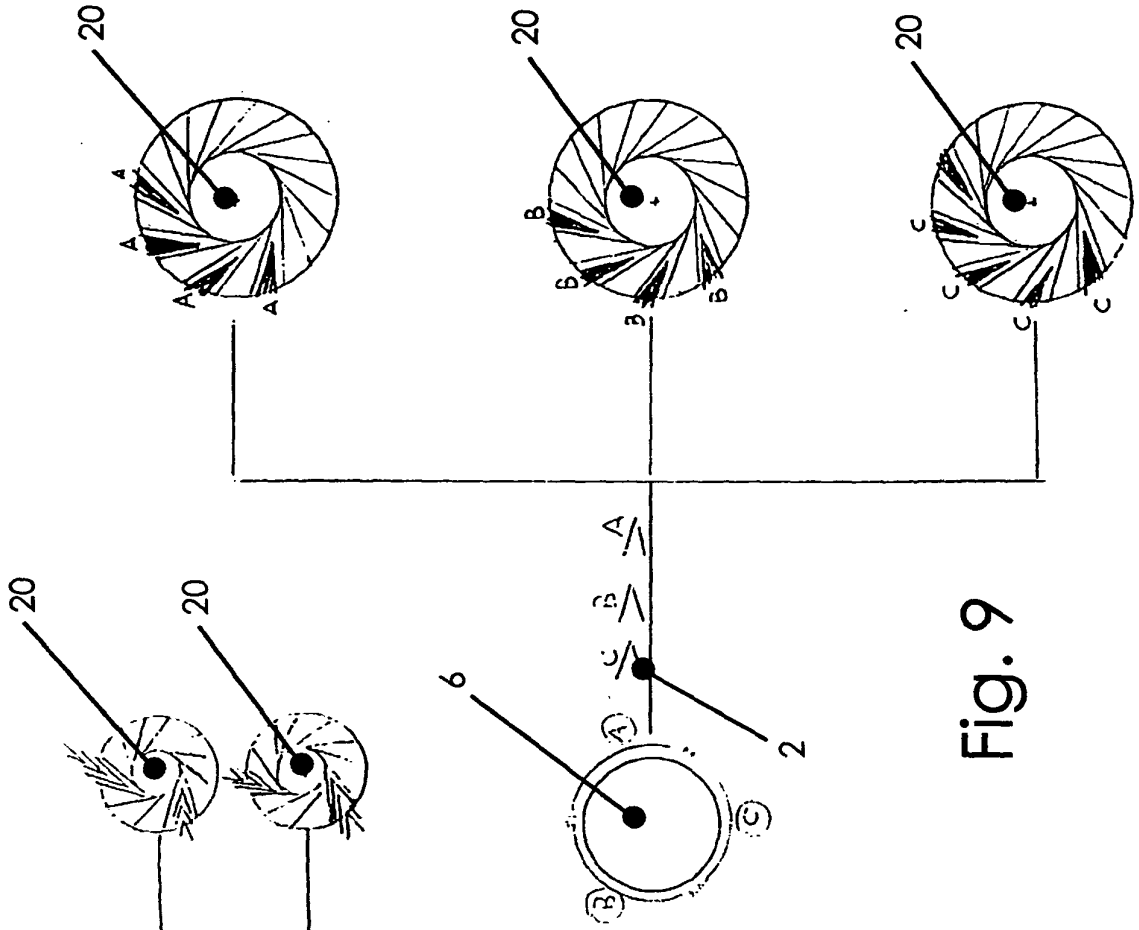

Fig. 9

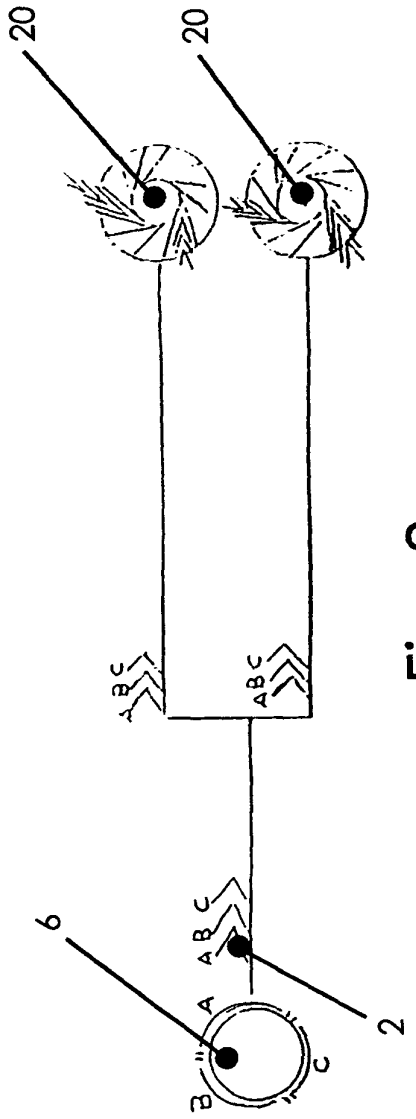

Fig. 8

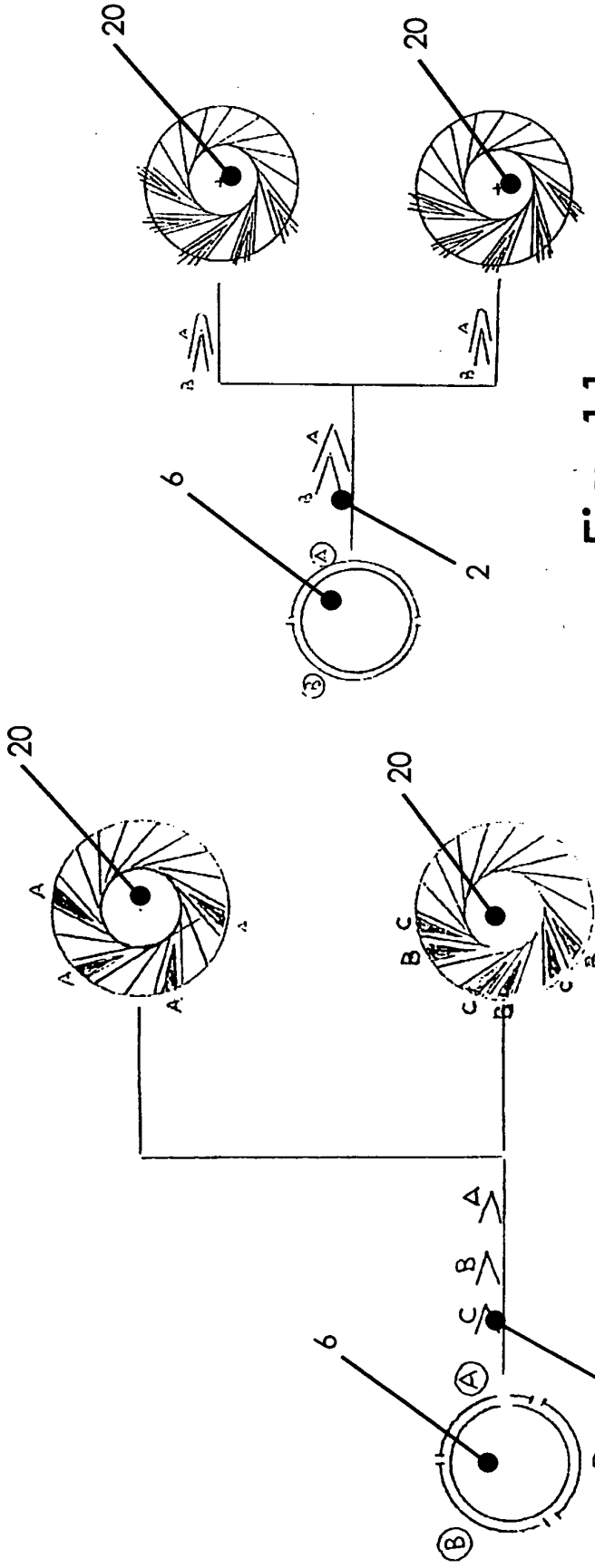

Fig. 11

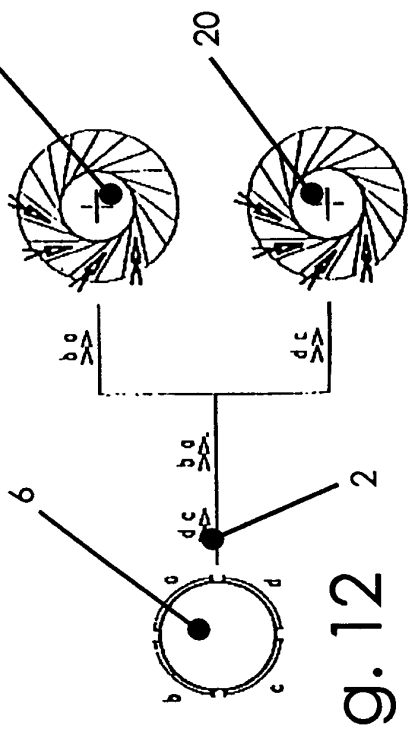

Fig. 12

Fig. 10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5584

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A	* column 6, line 45 - column 7, line 26 *	2-7	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 January 2005	Hannam, M

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