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(54) A method and an apparatus for successively dispensing flat, flexible members from a magazine by means of a suction head system.

(57) A system for dispensing flat, flexible members (4) from the delivery end of a magazine (2), from which an edge portion of the foremost member (4) is bent outwardly by means of a guided suction head (14) and then brought into engagement with a pair of rollers (34,40), which draw the member out of the magazine. The edge portion is bent out into a recess (42) in the roller (40) and is kept unengaged by the rollers until the released suction head (14) is moved away from the following moving path of the edge portion when engaged by the rollers. Hereby the suction head (14) may be rapidly returned to the next foremost member, without waiting for the first member to be drawn out and without being scraped along the member surface.

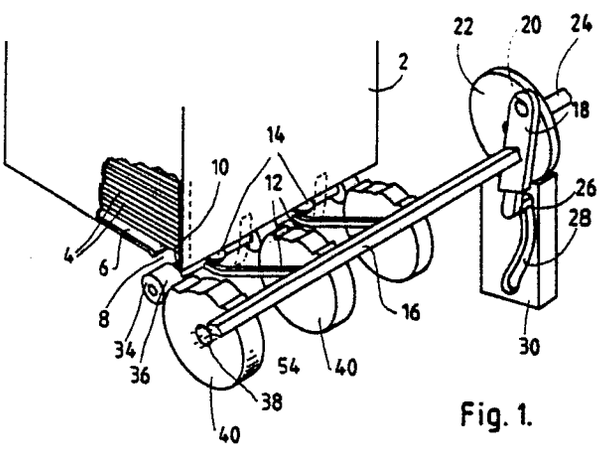

Fig. 1.

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A method and an apparatus for successively dispensing flat, flexible members from a magazine by means of a suction head system

The present invention relates to a method for dispensing flexible sheets from a magazine by means of a suction device which is brought to pull out the foremost sheet in the magazine for delivering the sheet to a conveyor device. Many methods and devices have been suggested and used herefor, and it should just be mentioned summarily that there is always a need for devices which may operate with improved operational reliability and greater speed in the simplest possible manner.

The invention is based on the consideration that a high reliability of the individual taking out of flat members such as paper sheets, periodicals, cardboard sheets, newspapers etc. will be obtained by an active bending out of a relatively small width of an edge area of the foremost member, while the remainder thereof is supported by a front wall of the magazine, such a bending being effectable by means of guided sucking discs with a very small or no risk of the corresponding edge of the next member being bent outwards equally, as this will require a very unusual force of adhesion between the edge areas. Furthermore, the edge area may be bent out past an inwardly protruding holder nose on the magazine along the free edge of the body, whereby an even greater reliability is obtained. The bent-out edge area is brought to engagement with a drawing device which may draw out the remaining portion of the member from the magazine by a lateral, outwards drawing movement and deliver the member to suitable conveyor means.

For obtaining a simple drawing device, the bent-out edge area may be brought into surface contact with a rotating drawer roller cooperating with a co-rotating dolly roller, but certain problems occur as to the introduction of the edge area between two such rollers upon a pure bending out of the edge area, and by the invention it is indicated how these problems may be solved in a simple manner. It has already been suggested that the sucking discs are swung outwards until the projecting front edge of the sheet member is caught by a pair of drawer rollers, and that the sucking discs are swung back after the drawing out of the sheet. However, for beginning the next operation cycle this return movement has to wait until the first sheet is entirely drawn out, which in practice implies a considerable delay in time. The invention provides for a method by which the sucking discs may be brought to engage the sheet already before the previous sheet has been completely drawn out from the magazine.

A relevant dispenser is suggested in DE-B-1,084,278, in which a suction head is caused to swing out the front edge area of the sheet to a position in which it projects into a recess in a rotating disc arranged laterally of the sucking head, such that during further rotation of the disc an end wall of the recess will hit the sheet and draw it off the sucking head and then automatically guide the sheet and portion into a driving engagement between the periphery of the disc and a cooperating pressure roller. Hereby the sucking head may be returned very soon, without waiting for the entire sheet to be pulled out, but an associated drawback is that the sucking head is subjected to a heavy wear by the said drawing off of the high number of consecutive sheets therefrom. The sucking head, of course, can be made by a rigid and wear resistant material, but only at the expense of the sheet gripping safety thereof. For that reason it is highly preferable to use a traditional semisoft suction disc.

It is the purpose of the invention to provide a dispensing method and device, by which the drawing out of the single sheet is effectable in a rapid and reliable manner with the use of an efficient sucking disc without this being subject to pronounced wear.

According to the invention this is achieved by arranging for the sucking head to be operationally released from the sheet just before the sheet is engaged by the said end wall of the recess in the rotating disc and then be moved ahead of the sheet and portion and retracted from the moving path thereof without being engaged by the sheet end portion. Thus, when the sucking head is released from the sheet and then moved actively away from the sheet no sliding wear will occur at the suction head, which, therefore, may well be made as an efficient semisoft suction disc.

In the following the invention, which is defined more closely in the claims and also comprises an apparatus for excuting the method, is explained in more detail below with reference to the drawing in which

Fig. 1 is a schematic perspective view of an apparatus according to the invention, whilst

Figs. 2-8 are side views of this of this apparatus.

The system shown in Fig. 1 consists of a magazine 2 for flat, bendable members 4, e.g. sheets or periodicals, which are desired to be delivered individually from the lower end of the magazine. The majority of the bottom of the magazine is covered by a bottom plate 6, between the front edge of which and the front side of the magazine is

left an open bottom portion 8, the front side of the magazine having, however, a lower, shortly backwardly projecting holder nose 10, which carries the front end of the members 4.

Underneath the open bottom portion 8, on a row of carrier arms 12, is placed a row of sucking discs 14, which may cooperate with the exposed underside of the lowermost member 4 in the magazine pile, see also Fig. 2. The carrier arms 12 are connected to a common carrier beam 16 which is arranged rigidly projecting from a connecting rod 18, which at its upper end is rotably connected with an excentric pivot 20 on a flywheel 22 which is kept in constant rotation by an axle 24. The lower end of the connecting rod 18 has a laterally outwardly projecting pin 26 which cooperates with a guiding track 28 in a fixed guiding block 30 such that hereby the sucking discs are movable through a desired trajectory path for each rotation of the wheel 22. This trajectory is designated 32 in Fig. 2.

In the respective spaces between the sucking discs 14, underneath the bottom portion 8, a row of wheels 34 is arranged on a common shaft 36, and in front of each of these wheels another row of wheels 40 of a larger diameter is placed on another common shaft 38.

As indicated in Fig. 2 the wheels 34 are entirely round while the wheels 40 are provided with a peripheral depression 42 between shoulder 44 and 46, of which the shoulder 44 leads from the outer wheel periphery 48 down to the depression 42, while the shoulder 46 leads from the depression 42 upwards or outwards to an intermediate peripheral level 50, which through a further shoulder 52 is led outwards to the outer periphery 48. The outer periphery is located closely against the wheel 34, the distance between the shafts 36 and 38 being adaptable, in an adjustable or resilient manner, such that the individual members 4 may be squeezed in between the wheels 34 and 40.

The shaft 38 of the wheels 40 is rotated synchronically with the flywheel 22, while the axle 36 and thereby the wheels 34 may optionally be arranged in a freely rotatable manner.

In an initial position for an operation cycle of the system the parts assume the positions shown in Fig. 2, in which the sucking discs 14 have just been brought to about the lower, foremost edge area of the lowermost member 4 in the magazine 2, while the depressions 42 of the wheels 40 are positioned right outside the lower front end of the magazine, while rotating in the rotation direction of the wheel 40 indicated by an arrow. The sucking discs 14 are activated through the carrier arms 12, which are suction conduits connected with a non-illustrated vacuum source through a cyclically activated valve. By means of the moving system shown to the right in Fig. 1 the sucking discs 14 are movable downwards along a first, arched partial portion I of the trajectory 32, whereby the sucking discs are rotated rearwards to the position indicated in dotted lines, being moved hereby as if they were rotated downwards about the front edge of the fixed magazine bottom plate 6. By this movement a downwards drawing of the front end area of the lowermost member 4 is carried out, and the front area will be drawn down past the holding nose 10 and so as to be swung down about the front edge of the bottom plate 6. As this swinging down is effected only on a foremost, relatively narrow partial portion of the member 4, the movement must be carried out with a considerable force and preferably with a rather accurately controlled movement of the sucking discs 14, and hereby a good reliability is obtained for the corresponding edge area of the overlying body 4 not following the downward rotation movement, this further being ensured by the presence of the holder nose 10.

The concerned swung-down position of the front edge area of the member 4 is indicated in full lines in Fig. 3. It is seen that the wheel 40 has at the same time been rotated to a position in which the depression 42 is brought inside the outer edge of the swung-down edge area, such that the down-swinging may continue slightly further without being obstructed by the wheels 40.

Thereafter the suction on the sucktion cups 14 is relieved and the cups 14 are moved through a trajectory portion II (Fig. 2), whereby they are very quickly swung downwards and forwards to a position outside the front edge of the bent-down member area. This movement is illustrated by an intermediate position in Fig. 4, wherein it is also shown that in the meantime the wheels 40 have been rotated so far that their shoulders 46 will abut the front edge of the member 4 and thereby not only keep the bent-down member area from being resiliently bent backwards, but actually effect a further bending down of the member area for this to rest against the wheels 34, while the sucktion discs 14 are rapidly brought outside the movement path of the front edge of the member 4 and thereafter led back towards the said initial position along a trajectory portion designated III, Fig. 2.

By the further rotation of the wheels 40 the shoulders 46 as shown in Fig. 5 will cause the outer end of the bent-down front edge area of the member 4 to be led inwardly against the wheel 34 while partially entwining this, the front end of the member 4 now being supported against the periphery of the intermediate depression 50. This depression does not provide for any fixed abutment pressure against the opposite wheel 34, i.e. the front edge of the member 4 remains stationary while the sucktion discs 14 are removed entirely from the area adjacent this front edge.

Thereafter - Fig. 6 - the same front edge will be forcefully pressed against the wheels 34, when the shoulder 52 is led past the engagement area and thereby constricts the same to the area between the wheels 34 and the outer peripheries of the wheels 40. Hereby, by the rotation of the wheels 40, a strong pull will be effected in the bent-out portion of the lower member 4, such that this member will be drawn downwards and thereby be drawn out from its planar position between the magazine bottom plate 6 and the overlying members 4. By this drawing-down with an associated drawing-out of the member 4 from the magazine the member 4 may be delivered to any suitable, non-illustrated device for further conveying of the individual, successively dispensed members 4.

The outer circumference 48 of the wheels 40 naturally has to be sufficiently large for ensuring that a complete drawing out of the single members 4 from the magazine may be effected before a new operation cycle begins.

In the embodiment shown in Figs. 7 and 8 some downwardly projecting holder fingers 54 are placed at the front edge of the magazine, e.g. as indicated in dotted lines in Fig. 1. These fingers, which may consist of flat springs, are downwardly and backwardly projecting such that their lower ends are positioned just inside the movement path of the front edge of the member 4 when this is bent down during the first phase of the operation sequence. The front edge of the member 4 will thereby slip down underneath the holder fingers, as indicated in Fig. 8, whereby the front edge will be kept from slipping back when the sucktion disc engagement is released and the sucking disc removed; this occurs briefly before the shoulder 46 on the wheel 40 reaches the member front edge and by relatively thick or stiff members 4 the front edge area might otherwise be swung resiliently backwards such that it would not be caught by the shoulder 46.

By using the holder fingers 54 the possibility of a continuous operation is thus obtained also by the handling of thick of semi-stiff objects, the sucktion discs 14 being allowed to release the member and be led out in front of the front edge thereof before the front edge is caught by the shoulder 46 for further displacement by the shoulder 52.

It would be possible to obtain that the sucktion discs 14 remained in engagement with the front edge of the sheet member until the shoulder 46 reached this area, but in that case the sucktion discs would have to be led hastily downwards after the release, whereby their movement would be inappropriately jerky and long, with corresponding requirements as to a high speed for the same cycle time.

For a desired rapid removal of the suction discs 14 from the front edge area of the member 4 it is appropriate that the sucktion discs are guided in such a manner that they are not led downwards and outwards, but are simultaneously swung horizontally through a horizontal position as indicated by the sequence according to Figs. 3, 4 and 5, as the inwardly oriented edges of the sucktion discs are hereby particularly quickly removed from the moving path of the front edge area of the member 4. The desired movement characteristic for the sucktion discs may be obtained in a simple manner just by means of the control system illustrated in Fig. 1, but will be appreciated that a suitable guiding will also be obtainable by other means.

As indicated the carrier arms 12 of the sucktion discs are placed on a common carrier beam, which may also function as a vacuum connection, but in practice it may be preferred that the sucktion discs have individual carrier and movement systems, preferably of the illustrated simple type, inasfar as it is hereby possible to operate the suction discs with a certain mutual phase displacement.

A possible alternative to the recess 50 will be a radial displacement by one of the wheels 34 or 40, such that these wheels (Fig. 5) are first kept slightly apart while the sucking head is removed from the area, and only thereafter are moved together for an effective drawing out of the member from the magazine.

Claims

1. A method of successively dispensing flat, flexible members (4) from a magazine by means of a suction head system, which is brought to draw out a front edge area of the foremost member in the magazine by a bending out of the front edge area from the magazine and hereby transferring the bent-out area to a draw-out system comprising cooperating wheels or rollers for drawing out the foremost member (4) from the magazine and delivering it to a receptacle or a conveyor while the suction head system is returned to an initial position for initiating a renewed taking out of the next member (4) from the magazine, said draw-out system comprising one or more rotating wheels provided with a recess for receiving the bent-out front edge portion of the member (4) and, by the associated rotation, bringing this portion into a clamping engagment between this or these wheels and one or more pressure rollers cooperating with the peripheral surface of the wheels, **characterized** in that the suction engagement between the suction head system and the front portion of the member (4) is relieved when the front portion has been moved into the said wheel recess and that the

suction heads are thereafter moved rapidly ahead of and outside the said front portion to enable the same to be further moved by the rotating wheel or wheels without such movement being obstructed by the suction head or heads.

2. A method according to claim 1, whereby the front portion of the member 4, upon being released from the suction head, is retained in a bent-out position in non-operative engagement with the drawing system during a time interval sufficient to permit the suction head to be moved out of the following movement path of said front portion.

3. An apparatus for carrying out the method claimed in claim 1, wherein means are provided for moving the suction head along generally triangular path first generally transversely away from the plane of the front end of the magazine and then, upon release of the bent out member portion, generally away from this portion to a position outside the front edge thereof and then back to the initial position.

4. An apparatus according to claim 3, in which the recess (42) of the rotating wheel (40) continues in a recess portion (50) of reduced depth.

5. An apparatus according to claim 3 or 4, in which a resilient holding member (54) is provided for snap locking the bent out member portion against return movement after the release of the suction head therefrom.

6. An apparatus according to claim 3, in which the suction head or heads are mounted on a carrier system protruding from a cyclically moved base member (18), which is at one end pivoted to a rotating eccentric (22), while at its other end it is guided reciprocally along a cam track (28).

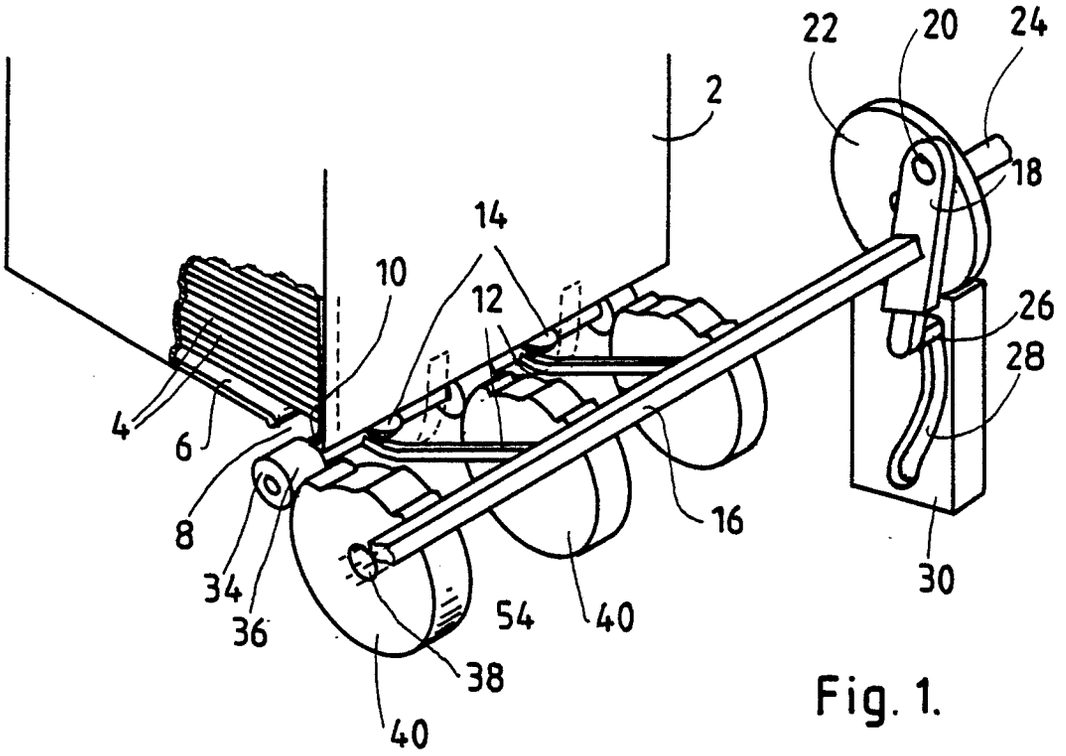
22
20
24
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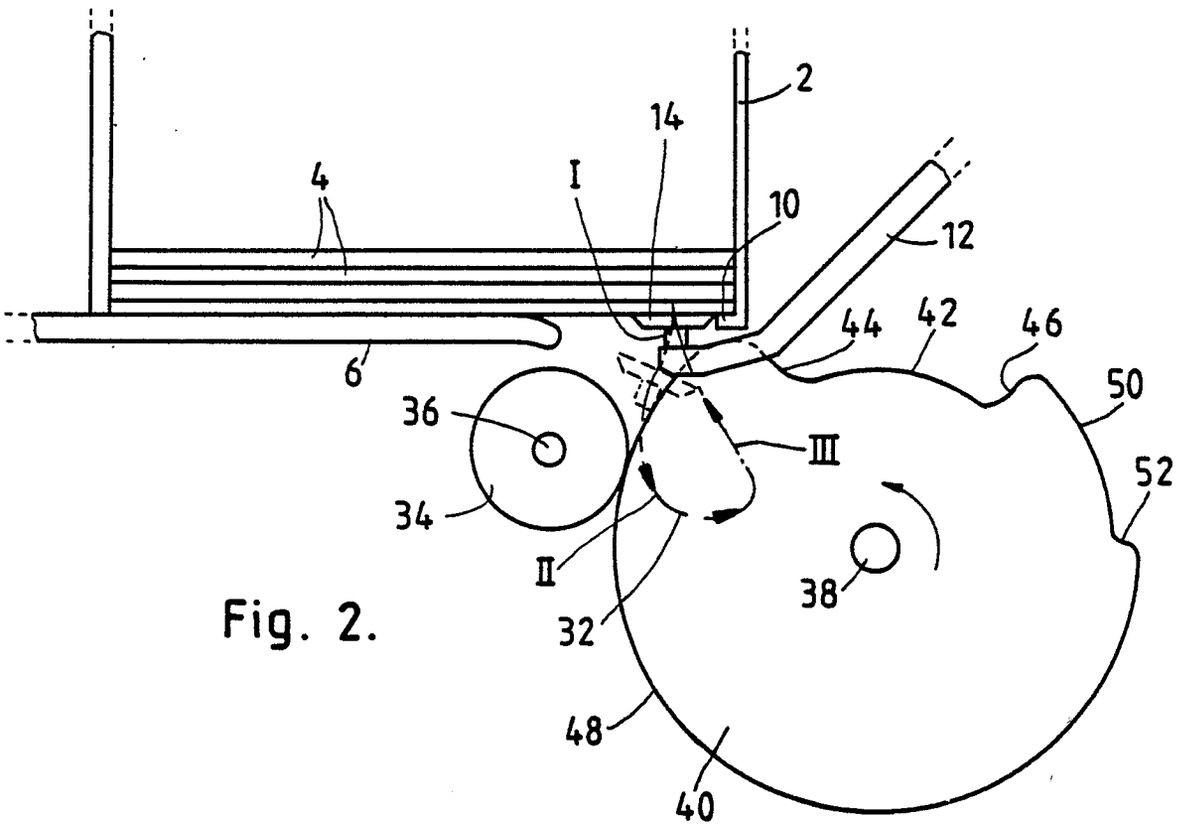
Fig. 1.


2
14
4
I
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III
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34
II
38
32
48
40

Fig. 2.

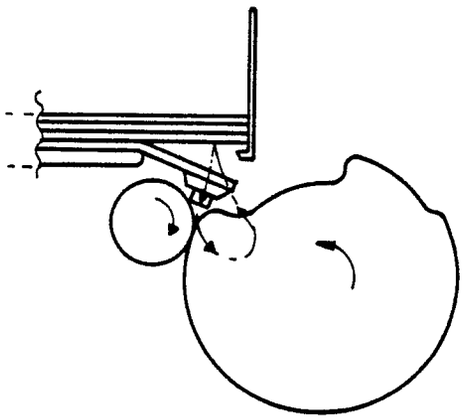

Fig. 3.

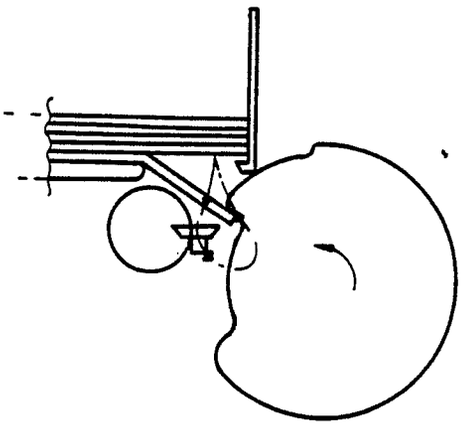

Fig. 4.

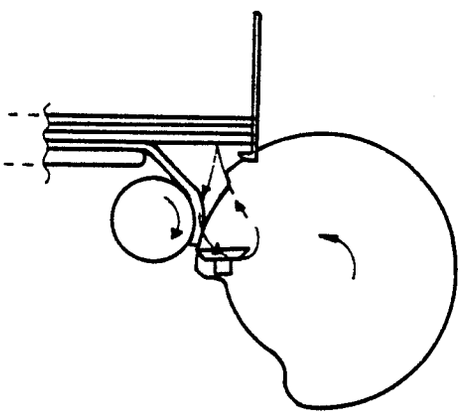

Fig. 5.

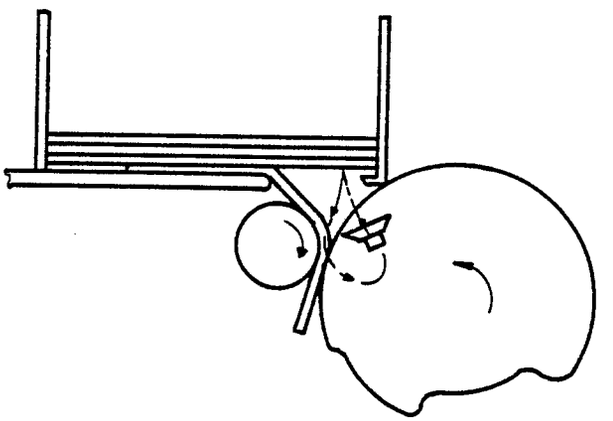

Fig. 6.

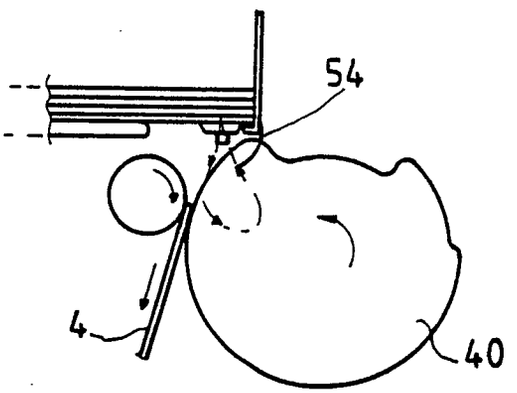

Fig. 7.

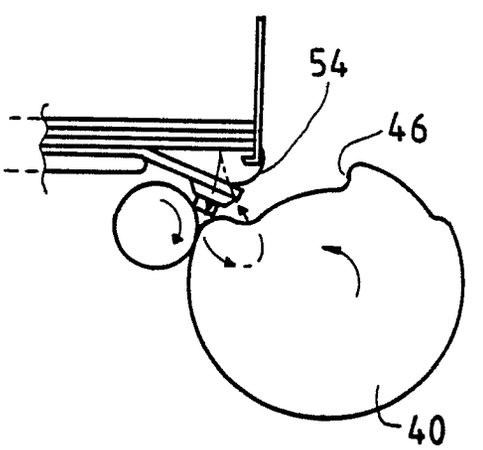

Fig. 8.

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EUROPEAN SEARCH REPORT

Application number

EP 87201923.7

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	DE - C - 401 933 (BROOKS, WARBEY) * Fig. 1-7; claim 1 * --	1,3,4	B 65 H 3/08 B 65 H 1/06
D,Y	DE - B - 1 084 278 (WINKLER, DÜNNEBIER) * Fig. 4 * ----	1,3,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 B
B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	14-12-1987	SÜNDERMANN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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