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(54) METHOD FOR MANUFACTURING BOARD PACKAGES OR CONTAINER THAT ARE PROVIDED WITH PRINTS

VERFAHREN ZUR HERSTELLUNG VON BEDRUCKTEN PAPPVERPACKUNGEN ODER BEHÄLTERN

PROCÉDÉ DE FABRICATION D'EMBALLAGES OU DE CONTENEURS EN CARTON COMPORTANT DES IMPRESSIONS

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Description

[0001] The invention relates to a method of manufacturing board (paperboard/cardboard) packages or containers that are provided with prints, in which method a board blank that is provided with prints is bent and seamed into its desired shape. The containers that are manufactured according to the invention include disposable board drinking cups, in particular.

[0002] Board cups are manufactured as disposable drinking cups on a mass scale. Additionally, board cups or similar board containers are usable, among others, as packages of foodstuffs, such as yoghurts, sour whole milk and desserts, as well as sweets, which packages can be closed with a cover. The sides of the containers are mostly provided with prints, which can describe the packaged product or which can be comprised of other advertising, promotional or decorative prints.

[0003] At present, cups that are provided with prints are manufactured by printing board, which is conveyed from a roll, by flexographic or gravure printing, which board can be rewound after the printing. The next stage of operation comprises cutting the blanks, which form the cup bodies, from a web. The cutter can consist of a slitting roller that is against the web, or a punching knife that moves in a reciprocating manner. The cut blanks are stacked and the rest of the web becomes waste. The stack of blanks is transferred to a cup machine, which generally bends the blank into a frusto-conical cup body and seams it together with a round bottom to form the finished cup. The cups that can be placed within each other are stored up in stacks to be delivered to customers.

[0004] In packaging technology, it is generally also well-known to unload the cut unprinted packaging blanks from the stack onto a conveyor, print the moving blanks and then re-stack the printed blanks. The specification WO02/09942 A1 describes such a process, wherein the printing is carried out by digital printing. The specification WO91/10595 describes a similar process, wherein printing the blank can also be followed by bending the blank into a package without a new intermediate stacking thereof. In the specification WO97/27053, the digital printing of a moving packaging material web is connected to a packaging machine, which manufactures packages from the web and, thereafter, fills them up and closes them.

[0005] The specification US 6102536 describes a production line of product packages that comprises the digital printing of a web, bending the web and filling it with the product to be packaged and, finally, seaming it into single closed packages. According to the specification, different prints can be stored in the memory of a computer and retrieved for use, as required. The specification also presents a possibility to change the printing during the process, so that, according to an example, two different figures can be printed on the packages alternatively.

[0006] The present production process of printed board cups described above is suitable for large-scale mass production of cups, wherein the production sequences consisting of mutually similar cups are long, comprising hundreds of thousands of cups or more. In such long production sequences, the manufacturing costs per cup remain low. Instead, for shorter production sequences of less than 50 000 cups, the present technology is slow and the costs per cup become high.

[0007] The purpose of the invention is to solve the problem mentioned above by providing a manufacturing technique for printed board packages or containers, such as drinking cups, by which the costs per unit can be kept reasonable, even inexpensive, in short production sequences. The method according to the invention is characterized in that containers or packages with different prints are manufactured in successive production sequences, wherein the moving board web is digital-printed and blanks are cut from the printed web in a single continuous process, whereby the printing is changed between the production sequences without discontinuing the movement of the web and the printing process and, after the seaming, the containers or packages of the different production sequences are separated from each other.

[0008] By combining the printing and the cutting of blanks according to the invention, firstly, the winding process of the printed web according to the previous manufacturing technique of the cups, or stacking the unprinted blanks that are cut from the web and unloading the stack for the printing, are avoided. Furthermore, since by applying the digital printing, it is possible to change the print, i.e., the text, graphics and images that are printed on the side of the containers or packages without interrupting the printing process, short production sequences, where the prints are different, can preferably be manufactured according to the invention in succession as a single long manufacturing process, whereby the advantages of long production sequences are achieved, including low costs per package or container. The digital printing even makes it possible to change the printing within the production sequences, so that the containers or packages of the run can be numbered or otherwise individually distinguished from each other, for example. By an automated process control, the various production sequences can be separated from each other, either before or after the seaming stage; for example, when stacking the finished printed cups or other containers.

[0009] In addition to the manufacture of the stackable, lidless containers, such as drinking cups, the invention can be applied to a packaging technique that includes the filling of the container or other similar package, and its closing by seaming. The seamed containers can thus be moved to a filling machine, which will also provide the containers with a sealed cover. It is also possible to cut the blank from a web, and to bend, fill and seam it into a package at one and the same stage, as is the case in the filling machines that produce board drinking packages or other similar liquid packages. In these, the invention enables short production sequences, which can be sep-

arated from one another, and in which the prints of the packages differ but the packaged product remains the same from one run to another.

[0010] The simplification of the manufacture of containers or packages according to the invention also enables essentially faster deliveries than before from the factory to the customer. According to calculations, the invention enables the profitable manufacture of production sequences as small as about 2000 pieces; and the costs per unit of runs of about 10000-20000 pieces are not considerably higher than those of long production sequences. To achieve the same unit cost, the flexographic printing would require a production sequence of about 40000-70000 pieces, depending on the number of printing inks required.

[0011] The process according to the invention aims at printing and cutting the board web into blanks, while the web continuously moves at a constant velocity. According to the invention, however, a buffer can be arranged between the printing and cutting stations, which stores the printed web, in case the cutting of the web slows down or is interrupted for one reason or another, so that the printing does not immediately need to be slowed down or discontinued. Depending on the capacity of the buffer, printing the web can thus be continued at a constant velocity irrespective of minor disturbances in cutting the blanks, filling the packages or stacking the containers. After clearing the disturbance, the movement of the web at the cutting stage can temporarily be accelerated to unload the stock accumulated in the buffer.

[0012] According to an application of the invention, the digital printing of the web, cutting of the blanks from the printed web and the manufacture of containers, such as drinking cups, from the blanks can be combined in a single continuous process, wherein the finished, seamed cups are stacked for the first time. In other words, the blanks are not stacked between the cutter and the cup machine. When manufacturing short production sequences one after the other, the cup machine separates the different runs into respective stacks. If the prints within a production sequence are changed, the cups in the stacks can be arranged, for example, in a numerical order or according to another principle.

[0013] The aspects of the process according to the invention further include the automatic monitoring of the completion of fixed-size production sequences. This can be utilized in synchronizing the change in-printing and the separation of runs, in identifying the runs and directing them apart, and in monitoring the completion of the runs, so that a shortage in the run causes a signal in the digital printing head to print pieces that complete the run.

[0014] Depending on the purpose of use, the board containers and packages require a liquid-tight polymer coating on their inner surfaces and, preferably, also on their outer surfaces, to prevent the board from wetting. In drinking cups, the inner coating is an absolute necessity. The outer surface of the cup that is to be printed can be, for example, provided with one or more layers of low density polyethylene (LDPE) and/or ethylene methyl acrylate copolymer (EMA), these polymers being well-suited to digital printing by dry toner, cf. the specifications WO03/054634 and WO2005/124469 A1. Alternatively, the digital printing can comprise ink-jet printing.

[0015] The print quality and the printing surface of the digital printing, particularly, if it is lacquered after printing, are of high quality, whereby the containers and packing boxes manufactured according to the invention can be used, among others, as gift packages, packages of clothes, and for purposes other than the drinking cups and food casings, which have been used until now.

[0016] The equipment for implementing the manufacturing process of the printed board cups according to the invention described above can include a digital printing press for printing the continuous board web, a cutter placed after the same for cutting the blanks with prints from the web, while the printing and cutting take place as a continuous process, and a cup machine for bending the blanks into bodies and seaming them with bottoms into cups, as well as the stacking of finished cups. According to the invention, a buffer can be placed between the printing machine and the cutter for storing the printed web in the cutter, when the movement of the incoming web is slowed down or discontinued.

[0017] In the following, the invention is described in detail by means of examples and with reference to the appended drawings, wherein

Fig. 1 shows the manufacturing process of printed board cups according to the invention, from a wound unprinted board into finished, stacked cups;

Fig. 2 shows the cutting of body blanks from the printed board web according to the line II-II of Fig. 1, as viewed from above;

Fig. 3 shows the cup machine according to the line III-III of Fig. 1, as viewed from above;

Fig. 4 shows the cutting of blanks from the web, as viewed from above, and their moving to the cup machine according to another embodiment of the invention;

Fig. 5 shows a branched suction pipe of the cups according to the line V-V of Fig. 1, as viewed from above;

Fig. 6 shows adjacent suction pipes as an alternative application, as viewed from above, respectively.

[0018] In Fig. 1, the cups are manufactured from an unprinted, polymer-coated board web 1, which is unwound at a constant velocity from a machine roll 2 that is produced by a coating machine. The web 1 is first subjected to printing by a digital printing machine 3 that uses a dry toner, which prints the desired print on the bodies

of the cups, which print can consist of text, graphics and/or images and be monochrome or polychrome. The web 1 is subjected to a pre-corona treatment 4, after which the web is printed electrostatically by the dry toner, which transfers onto the surface of the web from a rotating drum 5, in an image transfer station 6 that is oppositely charged with respect to the charge of the toner particles. When rotating, the drum 5 passes by a cleaner 7, which brushes any extra toner particles from the drum, an electric charger 8, a printing head 9, which forms a latent image by selectively removing charge from the drum, corresponding to the desired print, and the developer 10 of the latent image, which makes the electrically charged dry toner stick to the charged areas of the drum. Thus, the dry toner particles become attached to the surface of the drum 5, corresponding to the desired print, and move onto the board web in the electric field of the image transfer station 6.

[0019] On the route of the web 1 immediately after the image transfer station 6, there is a discharger, which allows the web to come off the drum 5. The web 1 continues to a fixing station 11, where the polymer coating of the web is melted by infrared radiation, so that the toner particles fuse and stick to the surface of the web. If there is a carrier polymer in the toner particles, it can also melt at the fixing stage of the printing. After the IR melting, the web is cooled so that the molten polymer solidifies. When so desired, the printed surface of the web can be lacquered (not shown).

[0020] The next working phase after the printing comprises cutting the body blanks 12 of the cups from the printed web 1'. However, a buffer 13 is placed on the route 1' of the web before this, in which buffer the web can be stored in case the travelling speed of the web in the digital printing machine 3 is higher than at the cutting stage of the blanks. The buffer 13 comprises successive rollers 14 that guide the web, which rollers can be moved in the transversal direction, so that the web bends into successive, alternately opposite courses 15 between the rollers, in the manner shown in Fig. 1. This enables the operation of the printing machine 3 at a constant velocity irrespective of a slow down of the process or even a short-term discontinuation at the cutting stage of the blanks. Correspondingly, the web that is stored in the buffer 13 can be unloaded by shortening the courses 15 and accelerating the cutting of the blanks 12, respectively.

[0021] According to Figs. 1 and 2, the body blanks 12 are cut by a reciprocating punching knife 16 in the transversal direction of the web, its punches being synchronized with the prints on the web 1', cf. Fig. 2. The blanks 12, of which one or more can be cut at the same time, depending on the size of the cups to be manufactured and the width of the web, continue to a conveyor belt 17 that follows the punching knife 16, and further to stacks 18, while the web material that is left over from the cutting is conveyed as reject onto a roller 19.

[0022] Instead of the depicted flat punching knife, the blanks can be cut by a rotary punching knife of the type shown in Fig. 4. Instead of winding, the rejected web material can be removed by a suction machine.

[0023] Next, the stack of blanks 18 is transferred to a cup machine 20, preferably by an automated mechanism (not shown). The stack 18 can comprise the body blanks of a production sequence that is provided with specific prints, or part of the blanks of the production sequence, or the stack can comprise the body blanks of several short production sequences that have different prints. In the cup machine 20, the stack of blanks 18 is placed on a feed conveyor that is in the feeding station 21 of the body blanks. In the cup machine 20, before the feeding station 21, there is the feeding station 23 of the stacked bottom blanks 22 of the cups. The cup machine 20 includes two revolving heads 24, 25, of which the first is provided with male moulds 26 that correspond to the shape of the cup, and the other one with female moulds 27 that correspond to the shape of the cup, the cups 26, 27 being arranged radially around the revolving heads 24, 25. The moulds 26 of the first revolving head 24 turn counterclockwise, whereby they arrive one by one at the feeding station 23 of the bottom blanks 22, where the respective bottom blank is sucked against the tip of the mould 26. Next, the mould 26 moves to the feeding station 21 of the body blanks 12, where the blank is wound around the frusto-conical mould. At the next working station 28, in the direction of rotation of the revolving head 24, the body and the bottom of the cup are seamed together. After this, the mould and the frusto-conical semi-finished cup on the mould move to a station 29, where the cup shifts from the male mould 26 of the first revolving head 24 into the female mould 27 of the second revolving head 25. For the shift, either or both moulds 26, 27 are arranged to be moved back and forth by the telescopic arm of the mould. The second revolving head 25 in the figures is also counterclockwise rotating, comprising a working station 30, where the opening of the cup is provided with a curled mouth, and a subsequent removing station 31, where the finished cup 32 is blown or sucked from the mould 27 into a pipe 33, which moves the cup to a stack 34. According to Fig. 5, the pipe is divided into two branches 33, 33a, which are adjusted by a flap 37 that works as a valve and is articulated at its head 36. When the production sequences come immediately one after another, the flap 37 turns and automatically guides the cups of the different runs to different stacks. Fig. 6 shows an alternative solution that comprises a disc 38 that contains parallel suction pipes 33, 33a, 33b, and the various runs are guided to their respective stacks by turning the disc, when the run is changed.

[0024] The variation of the invention shown in Fig. 4 comprises the aspect that, instead of the flat punching knife, the body blanks 12 of the cups are cut from the printed web 1' by a rotating punching knife that comprises a rotating roller 35, and the blanks are conveyed to the frusto-conical moulds 26 of the revolving head 24 without stacking the blanks in between. The manufacture of the cups 32 provided with prints from the wound board web

2, thus, takes place as a continuous process.

[0025] It is obvious to those skilled in the art that the various embodiments of the invention are not limited to the examples described above but may vary within the following claims. For example, instead of the dry toner printing shown in Fig. 1, ink-jet printing can be used as the digital printing technique. Instead of stacking, the finished printed cups can be conveyed to the filling machine to be filled with the product that is to be packed and closed with a cover. In that case, sorting into different production sequences can be carried out before or after the filling, whereby the continuity of the process can extend all the way to the finished cup packages that are filled and closed.

Claims

1. A method of manufacturing open board boxes or containers (32) that are provided with prints, wherein a board blank (12) that is provided with prints is bent and seamed into its desired shape wherein the open boxes or containers (32) with different prints are manufactured in successive production sequences, wherein a moving board web (1) is digital-printed and the blanks (12) are cut from the printed web (1') in a single continuous process, whereby the printing is changed between the production sequences without stopping the movement of the web and the printing process and, **characterized in that** the blanks are first cut from the printed web, then bent and seamed into their desired shape, and, **characterized in that** after seaming, the open boxes or containers of the different production sequences are separated from each other and stacked.

2. A method according to claim 1, **characterized in that** a buffer (13) is placed between the printing and cutting stages of the blanks (12), which buffer stores the web (1') that comes from the printing stage when the cutting slows down or is discontinued, by bending it into parallel, reciprocating courses (15), the length of which is being increased.

3. A method according to claim 2, **characterized in that** the movement of the web (1') that moves to the cutting stage is temporarily accelerated to unload the store that has accumulated in the buffer (13).

4. A method according to any of the preceding claims, **characterized in that** the board (1) comprises packing board that is coated with LDPE or EMA, into which the toner particles that constitute the print are fused by melting the polymer coating and/or the particles.

5. A method according to any one of the preceding claims for manufacturing printed board cups (32), wherein a blank (12) that is provided with prints is bent into a cup body and seamed with a bottom to form a cup, after which the finished cups are stacked, **characterized in that** cups (32) with different prints are manufactured in successive production sequences, wherein the moving board web (1) is digital-printed and the blanks (12) are cut from the printed web (1') in a single continuous process, whereby the printing is changed between the production sequences without stopping the movement of the web and the printing process, and the cups of the different runs are separated from each other by stacking them in different stacks.

6. A method according to claim 5, **characterized in that** the blanks (12) that are cut from the web (1') are stacked and moved to the cup machine (20) that manufactures the cups (32).

7. A method according to claim 5 or 6, **characterized in that** the web (1') is cut in the cup machine (20), which bends and seams the blanks (12) without stacking them in between.

8. A method according to any of claims 5-7, **characterized in that** blanks (12) with the shape of a circle sector truncated by a circular arch are cut from the web (1') to produce frusto-conical cups (32).

Patentansprüche

1. Verfahren zur Herstellung von offenen Schachteln oder Behältern (32) aus Pappe oder Karton, welche mit Drucken versehen sind, bei welchem ein mit Drucken versehener Zuschnitt (12) aus Pappe oder Karton, in die gewünschte Form gebogen und gefalzt wird, die offenen Schachteln oder Behälter (32) mit unterschiedlichen Drucken in aufeinanderfolgenden Produktionsabläufen hergestellt werden, in einem einzigen, kontinuierlichen Prozess eine sich bewegende Bahn (1) aus Pappe oder Karton digital bedruckt wird und die Zuschnitte (12) aus der bedruckten Bahn (1') ausgeschnitten werden, wobei der Druck zwischen den Produktionsabläufen ohne Anhalten der Bewegung der Bahn und des Druckvorganges geändert wird, **dadurch gekennzeichnet, dass** die Zuschnitte zunächst aus der bedruckten Bahn ausgeschnitten und anschließend in die gewünschte Form gebogen und gefalzt werden, und **dadurch gekennzeichnet, dass** die offenen Schachteln oder Behälter aus den verschiedenen Produktionsabläufen nach dem Falzen voneinander getrennt und gestapelt werden.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** zwischen den Druck- und Schneidstufen für die Zuschnitte (12) ein Puffer (13)

angeordnet ist, der bei Verlangsamung oder Unterbrechung des Schneidvorganges die aus der Druckstufe kommende Bahn (1') speichert, indem er die Bahn in parallele, in entgegensetzten Richtungen laufende Bahnstrecken (15), deren Länge erhöht wird, biegt.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet, dass** die Bewegung der sich zur Schneidstufe bewegenden Bahn (1') vorübergehend beschleunigt wird, um den in dem Puffer (13) akkumulierten Vorrat zu entladen.

4. Verfahren nach einem oder mehreren der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Pappe oder der Karton (1) mit LDPE oder mit EMA beschichtete(n) Packpappe oder -karton umfasst, in welche(n) die Tonerteilchen, aus denen der Druck besteht, durch Schmelzen der Polymerbeschichtung und/oder der Teilchen eingeschmolzen wird.

5. Verfahren nach einem der vorangehenden Ansprüche zur Herstellung von bedruckten Pappbechern (32), bei welchem ein mit Drucken versehener Zuschnitt (12) zu einem Becherkörper gebogen und mit einem Boden zusammengefalzt wird, um einen Becher zu formen, und danach die fertigen Becher gestapelt werden, **dadurch gekennzeichnet, dass** Becher (32) mit unterschiedlichen Drucken in aufeinanderfolgenden Produktionsabläufen hergestellt werden, wobei in einem einzigen, kontinuierlichen Prozess die sich bewegende Bahn (1) aus Pappe oder Karton digital bedruckt wird und die Zuschnitte (12) aus der bedruckten Bahn (1') ausgeschnitten werden, wobei der Druck zwischen den Produktionsabläufen ohne Anhalten der Bewegung der Bahn und des Druckvorganges geändert wird und die Becher verschiedener Läufe voneinander getrennt werden, indem diese in verschiedenen Stapeln gestapelt werden.

6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, dass** die aus der Bahn (1') ausgeschnittenen Zuschnitte (12) gestapelt und zu der Bechermaschine (20) bewegt werden, in welcher die Herstellung der Becher (32) erfolgt.

7. Verfahren nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** das Schneiden der Bahn (1') in der Bechermaschine (20), in welcher die Zuschnitte (12) gebogen und gefalzt werden, erfolgt, ohne dass diese zwischendurch gestapelt werden.

8. Verfahren nach einem oder mehreren der Ansprüche 5-7, **dadurch gekennzeichnet, dass** Zuschnitte (12), welche die Form eines durch einen kreisförmigen Bogen abgeschnittenen Kreissektors aufweisen, aus der Bahn (1') ausgeschnitten werden, sodass kegelstumpfförmige Becher (32) erzeugt werden.

Revendications

1. Procédé de fabrication de boîtes ou conteneurs en carton ouverts (32) comportant des impressions, dans lequel une découpe en carton (12) comportant des impressions est pliée et assemblée dans la forme souhaitée, dans lequel des boîtes ou conteneurs ouverts (32) avec des impressions différentes sont fabriqués dans des séquences de production successives, dans lequel une bande de carton mobile (1) est imprimée numériquement et les découpes (12) sont découpées à partir de la bande imprimée (1') dans un seul processus continu, moyennant quoi l'impression est changée entre les séquences de production sans stopper le mouvement de la bande et le processus d'impression et, **caractérisé en ce que** les découpes sont tout d'abord découpées à partir de la bande imprimée, puis pliées et assemblées dans la forme souhaitée, et **caractérisé en ce que**, après assemblage, les boîtes ou conteneurs ouverts des différentes séquences de production sont séparés les uns des autres et empilés.

2. Procédé selon la revendication 1, **caractérisé en ce qu'**un tampon (13) est placé entre les étapes d'impression et de découpe des découpes (12), lequel tampon stocke la bande (1') qui vient de l'étape d'impression lorsque la découpe ralentit ou est interrompue, en la pliant en allers et retours parallèles (15), dont la longueur va en augmentant.

3. Procédé selon la revendication 2, **caractérisé en ce que** le mouvement de la bande (1') qui se déplace vers l'étape de découpe est momentanément accéléré pour décharger la bande stockée qui s'est accumulée dans le tampon (13).

4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le carton (1) comprend un carton d'emballage qui est revêtu de PEBD ou d'EMA, dans lequel les particules de toner qui constituent l'impression sont fusionnées en faisant fondre le revêtement de polymère et/ou les particules.

5. Procédé selon l'une quelconque des revendications précédentes destiné à la fabrication de gobelets en carton imprimés (32), dans lequel une découpe (12) comportant des impressions est pliée en un corps de gobelet et assemblée avec un fond pour former un gobelet, après quoi les gobelets finis sont empilés, **caractérisé en ce que** des gobelets (32) avec des impressions différentes sont fabriqués dans des

séquences de production successives, dans lequel la bande de carton mobile (1) est imprimée numériquement et les découpes (12) sont découpées à partir de la bande imprimée (1') dans un seul processus continu, moyennant quoi l'impression est changée entre les séquences de production sans stopper le mouvement de la bande et le processus d'impression, et les gobelets des différents passages sont séparés les uns des autres en les empilant dans des piles différentes.

6. Procédé selon la revendication 5, **caractérisé en ce que** les découpes (12) qui sont découpées à partir de la bande (1') sont empilées et déplacées vers la machine à gobelets (20) qui fabrique les gobelets (32).

7. Procédé selon la revendication 5 ou 6, **caractérisé en ce que** la bande (1') est découpée dans la machine à gobelets (20), qui plie et assemble les découpes (12) sans les empiler entre-temps.

8. Procédé selon l'une quelconque des revendications 5 à 7, **caractérisé en ce que** des découpes (12) ayant la forme d'un secteur de cercle tronqué par un arc circulaire sont découpées à partir de la bande (1') pour produire des gobelets tronconiques (32).

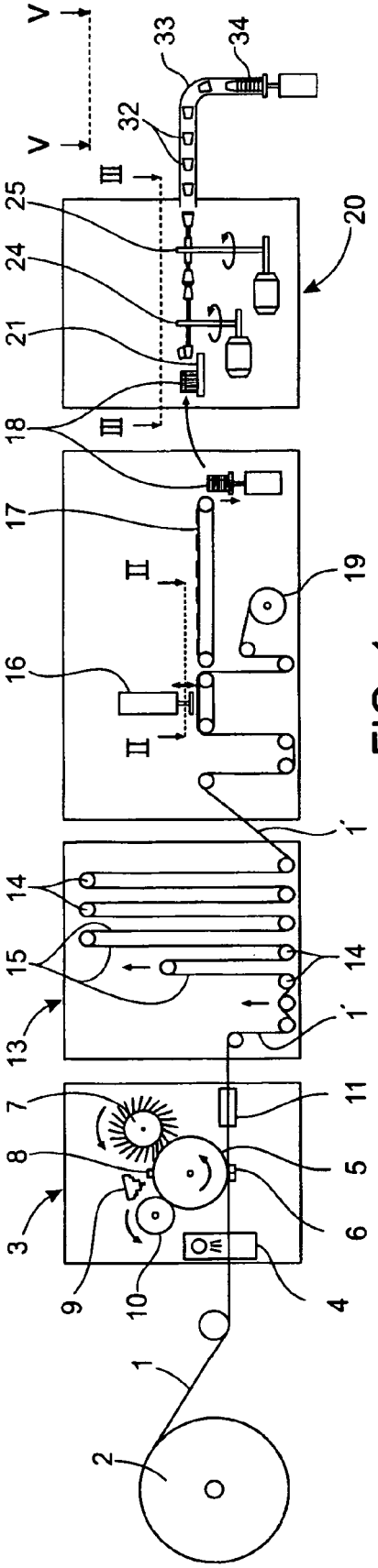

FIG. 1

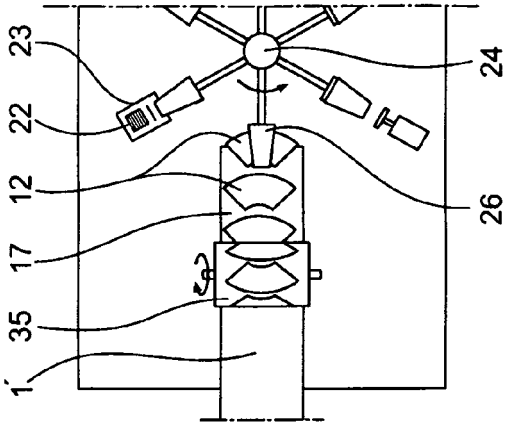

FIG. 4

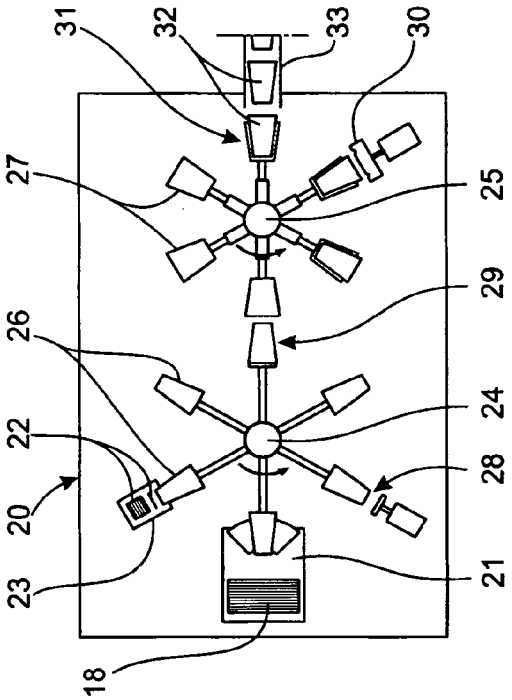

FIG. 3

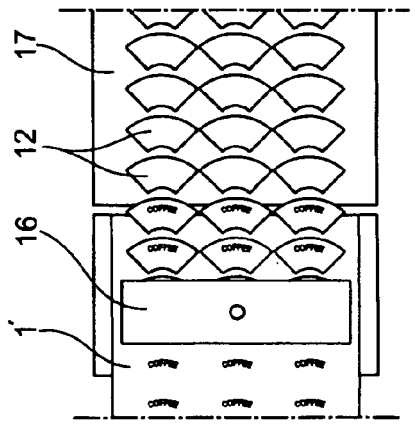

FIG. 2

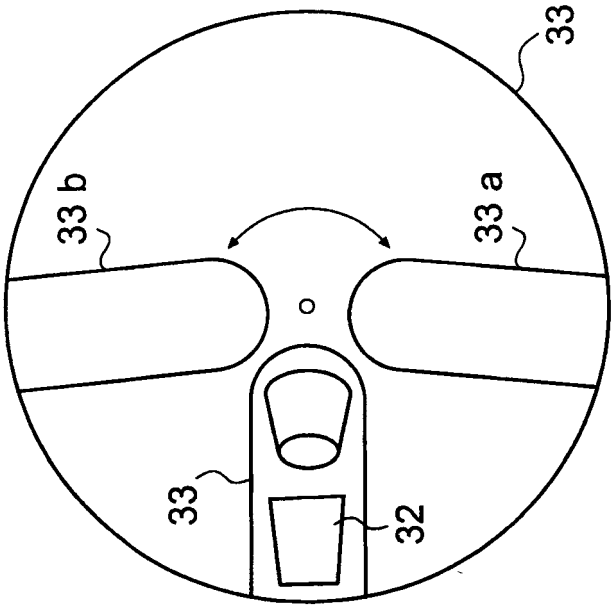

FIG. 6

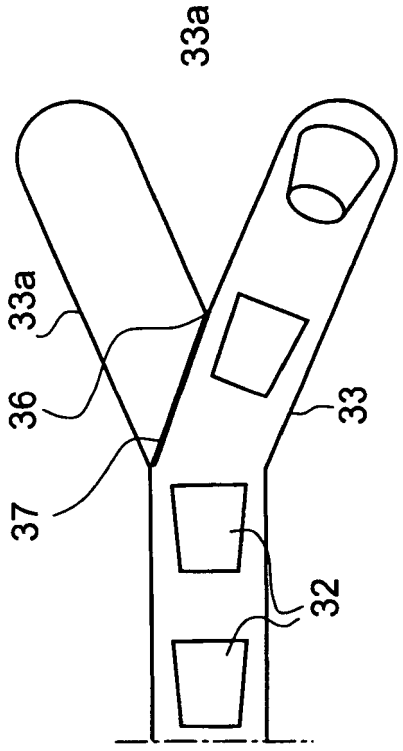

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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