



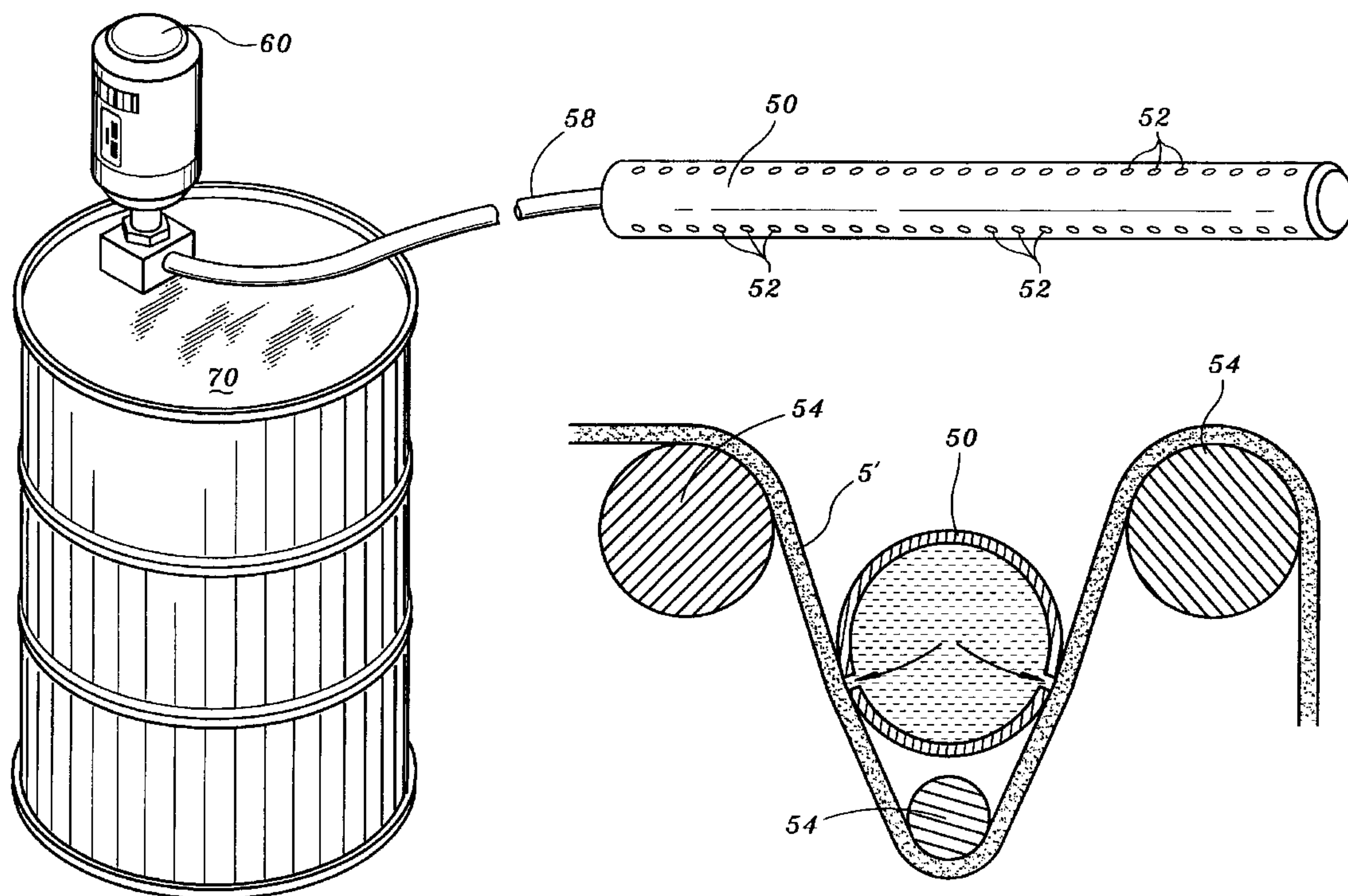
(86) Date de dépôt PCT/PCT Filing Date: 2000/04/14
(87) Date publication PCT/PCT Publication Date: 2000/11/02
(45) Date de délivrance/Issue Date: 2008/02/05
(85) Entrée phase nationale/National Entry: 2001/10/10
(86) N° demande PCT/PCT Application No.: EP 2000/003415
(87) N° publication PCT/PCT Publication No.: 2000/065141
(30) Priorités/Priorities: 1999/04/23 (US60/130,773);
2000/02/15 (US09/504,098)

(51) Cl.Int./Int.Cl. *D06B 21/00* (2006.01),
C11D 3/50 (2006.01), *D06B 1/02* (2006.01),
D06B 1/08 (2006.01), *D06F 58/20* (2006.01),
D06M 13/00 (2006.01), *D06M 23/00* (2006.01),
C11D 17/04 (2006.01)

(72) Inventeurs/Inventors:
HSU, FENG-LUNG, GORDON, US;
SCHNAUDIGEL, KEVIN, US;
FREDERICKS-MEYER, FRANCOISE, US;
FOX, DANIEL, JOSEPH, US;
AHART, ROBERT J., US;
...

(73) Propriétaire/Owner:

(54) Titre : PROCÉDE DE FABRICATION DE FEUILLES POUR SECHE-LINGE
(54) Title: PROCESS FOR MAKING DRYER SHEETS



(57) Abrégé/Abstract:

A process for fabricating dryer sheets comprises: providing a rolled web, said web comprising a material suitable for retaining fabric treatment ingredients; unrolling a portion of the rolled web; applying fabric treatment ingredients to the unrolled web portion in a first coating step; applying perfume to the unrolled web in a second step; and cutting and boxing at least a portion of the treated and perfumed web; wherein at least 50 % by weight of the total perfume in the final boxed web is applied in the second step.



(72) **Inventeurs(suite)/Inventors(continued):** LOVAS, JOHN, EDWARD, US; VAN BLARCOM, DAVID, US;
NEUSER, KRISTINA, MARIE, US

(73) **Propriétaires(suite)/Owners(continued):**UNILEVER PLC, GB

(74) **Agent:** BERESKIN & PARR

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : D06B 21/00, D06M 13/00, 23/00, D06F 58/20	A1	(11) International Publication Number: WO 00/65141 (43) International Publication Date: 2 November 2000 (02.11.00)
--	-----------	---

(21) International Application Number: PCT/EP00/03415 (22) International Filing Date: 14 April 2000 (14.04.00) (30) Priority Data: 60/130,773 23 April 1999 (23.04.99) US 09/504,098 15 February 2000 (15.02.00) US (71) Applicant (for AE AU BB CA CY GB GD GH GM IE IL KE LC LK LS MN MW NZ SD SG SL SZ TT TZ UG ZA ZW only): UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB). (71) Applicant (for all designated States except AE AU BB CA CY GB GD GH GM IE IL IN KE LC LK LS MN MW NZ SD SG SL SZ TT TZ UG ZA ZW): UNILEVER NV [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL). (71) Applicant (for IN only): HINDUSTAN LEVER LIMITED [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Maharashtra, 400 020 Mumbai (IN).	(72) Inventors: HSU, Feng-Lung, Gordon; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). SCHNAUDIGEL, Kevin; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). FREDERICKS, Francoise; 464 Park Avenue, Hackensack, NJ 07601 (US). FOX, Daniel, Joseph; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). AHART, Robert; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). LOVAS, John, Edward; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). BLARCOM van, David; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). NEUSER, Kristina, Marie; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). (74) Agents: ELLIOTT, Peter, William et al.; Unilever PLC, Patent Department, Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB). (81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
--	---

(54) Title: PROCESS FOR MAKING DRYER SHEETS
(57) Abstract A process for fabricating dryer sheets comprises: providing a rolled web, said web comprising a material suitable for retaining fabric treatment ingredients; unrolling a portion of the rolled web; applying fabric treatment ingredients to the unrolled web portion in a first coating step; applying perfume to the unrolled web in a second step; and cutting and boxing at least a portion of the treated and perfumed web; wherein at least 50 % by weight of the total perfume in the final boxed web is applied in the second step.

PROCESS FOR MAKING DRYER SHEETS

Technical Field

5

The present invention relates to a process for fabricating dryer sheets.

Background and Prior Art

10

15

20

A well known commercial product in the laundry care industry is the fabric dryer sheet. In use, the consumer typically uses at least one sheet in the drying cycle of the laundering process. The sheets generally include a substrate material, such as a web, wherein the substrate carries one or more ingredients to impart desired benefits to the clothing. These ingredients can include, for example, perfumes, anti-static agents, dye transfer inhibitors, whitening agents, enzymes, stain repellents and wrinkle reducing agents.

25

Processes for fabricating these dryer sheets are also well known. In a typical process, a large roll of web material is guided at high speeds through various coating, smoothing and drying/cooling steps wherein one or more ingredients are applied to the web. An example of this process is shown in Figure 1.

- 2 -

With reference to Figure 1, web 5 is preferably a polyester material and provided in rolls 2. Rolls 2 are typically about 37 inches (0.94 metres) to about 85 inches (2.16 metres) in width and have a length between about 8,000 and about 13,000 yards (7315 to 11887 metres). Web 5 passes through various rollers and rods wherein ingredients are applied to the web. As shown, web 5 is passed over guide roll 12 and onto applicator roll 14. Applicator roll 14 transfers ingredients 17 from coating pan 15 onto the web. A holding tank (not shown) can be used to supply the ingredients to coating pan 15. Preferably, automatic controls are used to ensure a proper level and temperature of ingredients 17 in pan 15.

As known in the art, ingredients 17 can include perfume material in addition to other fabric treatment agents, particularly those that provide anti-static and fabric softening benefits. These fabric treatment agents can include, for example: cationic compounds, such as quarternary ammonium compounds; nonionic surfactants, such as ethoxylated alcohols; fatty alcohols; fatty acids; alkali metal soaps of fatty acids; carboxylic acids and salts thereof; fatty acid esters; glycerides; waxes; anionic surfactants; water; optical brighteners; fluorescent agents; antioxidants; colorants; germicides; perfumes; bacteriocides; enzymes; dye transfer inhibitors; soil release polymers; skin care benefit agents; perfume carriers (e.g. starch, cyclodextrins), and wrinkle reducing agents. Various preferred non-cationic formulations are disclosed in U.S. Patent No. 6,133,226.

- 3 -

In prior art processes, perfume has been present from about 2 wt% to about 6 wt % based on total ingredients 17.

In a preferred embodiment, the ingredients are maintained at
5 approximately 140-190° F (60 - 80°C) in both the holding tank and coating pan 15. At this temperature, one or more ingredients can be lost to the atmosphere due to their volatility or be adversely affected by means of thermal degradation. When the perfume is present, it is estimated
10 that there is a loss of approximately 15 wt. % of the perfume to the atmosphere at this coating step.

Further on in the process of Figure 1, after being coated in the coating pan, coated web 5' passes over smoothing rod 18
15 to guide roll 20. From guide roll 20, the web passes to heating drum 22, and then travels to cooling drums 24 and 26, which are preferably cooled to below about 100° F (38°C) by chilled water. Cooled web 5' then passes to trimming station 28, wherein the web is rolled and preferably cut
20 into rolls 2'. Rolls 2' are preferably about 12 inches (0.30 metres) in width. At this point in the process, the rolls can be stored for later cutting and packaging. During the process shown in Figure 1, the web can travel as fast as 1,000 feet (305 metres) per minute. It is estimated that
25 the additional perfume lost after the step of coating can be in the range of approximately 20 wt. % to 30 wt. % from that which was originally present in pan 15.

Turning to Figure 2, final processing of coated web 5' is
30 carried out by passing one or more of the coated rolls 2'

- 4 -

through a series of guide rollers 32. The web is then folded by folders 34, passed to conveyor 36 and cut by knife 38. After cutting, the folded sheets are tamped down, stacked and accumulated for packaging.

5

During the above-described processes, it has been found that a significant amount of volatile agents, especially perfumes can be lost prior to final packaging. This is generally due to the relatively high volatility of most perfume agents.

10 For example, it has been found that up to 45 wt% of the perfume added in a typical process can be lost by the time the dryer sheet is folded and packaged.

Therefore, there is a need for an improved fabric dryer
15 sheet manufacturing process wherein the loss of volatile agents during the process of making the fabric sheets is minimized.

Perfume agents can be classified by their relative
20 volatility. Highly volatile perfumes are known as "high notes" while relatively unvolatile perfumes are known as "low notes". Due to their high volatility, high note perfumes are typically more perceptible by humans than low note perfumes. High note perfumes also have a wider range
25 of odours and, therefore, allow for greater flexibility when selecting perfume agents. Unfortunately, when manufacturing dryer sheets, it is the desired high notes that can be lost during processing. This has resulted in a decreased amount of high note perfumes making it into the packaged product
30 and alteration of the perfume profile. Use of high note

- 5 -

perfumes have also been reduced or eliminated from perfume formulations due to the above-described process conditions.

Therefore, there is also a need for fabric sheet
5 manufacturing techniques that would allow for increased usage of high note perfumes, wherein the highly volatile perfumes are retained on the fabric sheet so as to reach the consumer.

10 Objects of the Invention

It is an object of the present invention to overcome one or more of the aforementioned problems and provide one or more of the aforementioned benefits.

15

Thus, the present invention relates to a process that minimizes the loss of perfume and other volatile agents during the fabrication of dryer sheets.

20 For "simplicity, "perfume" will be used herein to describe any fabric treatment agent that can volatilize or degrade from heat in an undesirable manner. It is within the scope of the present invention, however, that other volatile agents or heat sensitive agents can be advantageously
25 applied by the presently disclosed process. It has been found that it is possible to de-couple the addition of volatile or heat sensitive agents from one or more of the manufacturing process steps, particularly those portions that run at a high speed and/or high temperature.

30

- 6 -

It has been found, for example, that by adding the perfume or other volatile agents closer to the step of packaging, i.e. after application of other ingredients in coating pan 15, there is less loss of ingredients to the atmosphere during the dryer sheet process. In the case of perfumes, this new process has less affect on the perfume profile and, therefore, a wider variety of perfumes can be used. In addition, because ingredients are no longer lost or lost to a lesser extent, less of the ingredient is needed when using the process of the present invention, resulting in raw material cost savings.

Definition of the Invention

Thus, according to the present invention there is provided a process for fabricating dryer sheets comprising:
providing a rolled web, said web comprising a material suitable for retaining fabric treatment ingredients;
unrolling a portion of the rolled web; applying fabric treatment ingredients to the unrolled web portion in a first coating step; applying perfume to the unrolled web in a second step; and cutting and boxing at least a portion of the treated and perfumed web; wherein at least 50% by weight of the total perfume in the final boxed web is applied in the second step.

Description of the Drawings:

Figure 1 illustrates a fabric sheet coating process that is known in the art;

- 7 -

Figure 2 illustrates a fabric sheet cutting and folding process that is known in the art;

Figure 3 illustrates a fabric sheet coating process that
5 generally shows a preferred location of applying fabric treatment agents, subsequent to the main coating operation;

Figure 4 illustrates a fabric sheet cutting and folding process that generally shows preferred locations of applying
10 fabric treatment agents, subsequent to the main coating operation;

Figure 5, illustrates a first preferred method and apparatus for applying fabric treatment agents to a substrate material
15 that can be used in the processes shown in Figures 3 and 4;

Figure 6 illustrates a second, preferred method and apparatus for applying fabric treatment agents to a substrate material that can be used in the processes shown
20 in Figures 3 and 4;

Figure 7 illustrates a preferred method of transferring liquid agents to the apparatus of figure 6; and

25 Figure 8 illustrates a fabric sheet cutting and folding process that shows the apparatus of figure 6 at preferred locations.

Detailed Description of the Invention

- 8 -

In a first preferred embodiment, the selected agent or agents are applied during high speed web movement after high temperature application of other ingredients. In a second preferred embodiment, the selected agent or agents can be applied just prior to folding and packaging.

With reference to Figures 3 and 4, processes in accordance with the present invention are shown. Figure 3 shows a first preferred fabric treatment agent application zone A, wherein ingredients can be added to web 5' subsequent to the coating of ingredients 17. Zone A is located after cooling drums 24, 26 and before cutting station 28. By applying perfumes and/or other fabric treatment agents at or near zone A, the high temperatures associated with the upstream coating operation are avoided. In addition, because web 5' is rolled-up at trimming station 28 shortly after application zone A, the fabric treatment ingredients become trapped as web 5' winds about itself.

Figure 4 shows second preferred application zones B. In this embodiment, the fabric treatment agents are applied prior to final folding and cutting of the substrate. Several zones are shown because the preferred process performs several cutting and folding operations simultaneously. An advantage of waiting to apply certain fabric treatment agents just prior to cutting and folding is that rolls 2' can be generic across several brands. More specifically, for example, if the only difference between two or more brands of product is the type or quantity of perfume, rolled stock 2' can be used for each brand as needed.

- 9 -

Turning to Figure 5, a preferred apparatus for applying fabric treatment agents to web 5' is shown. Spray assemblies 80 have controllers 81 and air flow modules 82 for controlling the flow and spray pattern of liquid spray 83 emitted from nozzles N. Spray assemblies 80 can be pressure spray assemblies or, more preferably, ultrasonic sprayers as shown. Preferred ultrasonic spray assemblies are available from Sono-Tek Corporation, Milton, NY. The Sono-Tek sprayers use ultrasonic power to atomize liquids. The flow of liquid from nozzles N and the flow of air from modules 82 are regulated by controllers 81. Controllers 81 can be programmed to apply more or less liquid agent and can be coupled to web speed information so as to apply predetermined, uniform quantities of fabric treatment agent. While three spray assemblies are shown, one or more can be used, depending on the width of web 5' and on the width of the spray. Spray assemblies can be used in zones A or B of Figures 3 and 4, respectively.

20

With reference to Figures 6 and 7, an alternate preferred apparatus for applying fabric treatment agents web 5' is shown. In Figure 6, the perfume applicator generally includes tubular member 50 having a plurality of micro holes 52.

25

Web 5' is directed past the applicator by one or more guide rolls 54. The number and configuration of guide rolls 54 is not critical and could even be eliminated.

30

- 10 -

Liquid fabric treatment agent is preferably pumped into applicator 50 by means of a metering pump 60 associated with tank 70. As shown, the liquid passes through tube 58, into one end of applicators 50. Most preferably, the liquid is
5 pumped into applicators 50 through a manifold (not shown) that directs the liquid into each end of the applicators 50. Such a system can provide a more uniform pressure profile within applicator 50. Applicators 50 are preferably fabricated from a low friction material that can apply the
10 fabric treatment agents to the web as it contacts tubular member/applicator 50 and passes over the micro holes. While two rows of micro holes are shown, various combinations of holes, slits or other orifices that allow the liquid to exit the applicator can be used. Applicators 50 can be used in
15 zones A or B of Figures 3 and 4, respectively. In Figure 8, several applicators of the type shown in Figure 6 are shown in use prior to the steps of cutting and folding.

In a preferred process where one or more of the fabric
20 treatment applicators are used to apply perfume, at least between about 50% to about 75% by weight of the total perfume in the final product is added after the high temperature coating operation. In a most preferred process about 95% to about 100% by weight of the total perfume in
25 the final product is added after the high temperature coating operation.

By applying certain fabric treatment agents at either or both zone A and zone B, the need for changing and cleaning
30 ingredients 17 in coat pan 15 can be eliminated, allowing for manufacturing efficiencies.

- 11 -

In practice it was unexpectedly found that the post-added perfume could absorb into the dryer sheet material that was processed as shown in Figure 1. By absorbing, the sheet
5 remained "non-tacky", and processing, such as cutting and packaging, were not hindered. See example 2, below.

Example 1

10 An 11 inch by 6.75 inch (27.94 cm by 17.15 cm) polyester substrate was first coated with 1.392 grams of anti-static/softening agent on a bench-top coater. Subsequently, 0.058 grams of perfume (4 % by weight, excluding the weight
15 of the substrate) was sprayed onto the coated sheet. This sheet (hereinafter referred to as the "Lab Sample") was representative of a sheet treated in accordance with the process of the invention. A production sheet was produced using the prior art process shown in Figures 1 and 2, i.e., without de-coupling the perfume from the coating step. The
20 perfume level in ingredients 17 dosed into coat pan 15 was also initially 4 % by weight. The lab sample and the production sheet were analysed by a Headspace G.C. The analysis data is shown in the following table.

25

Table 1.

Sample	Perfume added, g	Perfume remaining, g	Perfume Loss, %
Lab Sample	0.058	0.055	5.0
Production sheet	0.058	0.033	42.5

The data indicates that the process according to the invention has improved the perfume retention. Therefore,

- 12 -

for example, if the final product sold to the consumer only needs 0.033g of perfume to deliver the expected perfume benefit, the methods disclosed herein allow for the addition of only 0.0347g of perfume per sheet to deliver the same/expected amount - more than 40 % reduction in perfume use.

Example 2

10 An 11-inch (27.94 cm) wide dryer sheet roll was coated with anti-static/softening agent and perfume via the production process of Figure 1. The roll was mounted on a pilot scale coater. An applicator device as shown in Figure 6 was set to contact the web of dryer sheet between unwind and rewind
15 rolls. The roll was unwound and rewound at the speed of 10 ft/min (3.05 m/min) while a pump was pumping perfume with the flow rate of 1.03 g/min onto the coated web. The addition of perfume was equal to extra 4 % of perfume added to the sheet. The sheets with the extra 4 % perfume made by
20 this method showed a minimal increase of tackiness. Thus, the process was demonstrated.

- 13 -

CLAIMS

1. A process for fabricating dryer sheets comprising:
providing a rolled web, said web comprising a material
5 suitable for retaining fabric treatment ingredients;
unrolling a portion of the rolled web; applying fabric
treatment ingredients to the unrolled web portion in a
first coating step; applying perfume to the unrolled
web in a second step; and cutting and boxing at least a
10 portion of the treated and perfumed web; wherein at
least 50% by weight of the total perfume in the final
boxed web is applied in the second step.
2. The process according to claim 1, wherein no perfume is
15 applied in the first coating step.
3. The process according to claim 1, wherein the second
step is carried out by applying liquid perfume to the
web.
20
4. The process according to claim 1, wherein the second
step comprises contacting at least a portion of the web
with an applicator that dispenses perfume.
- 25 5. The process according to claim 4, wherein the
applicator is a generally tubular member having a
plurality of orifices.
6. The process according to claim 4, wherein the second
30 step comprises the steps of: providing a generally
tubular member; causing perfume to flow from an inner

- 14 -

portion of the generally tubular member to an outer
portion of the generally tubular member; and causing
the unrolled web portion to come in contact with the
perfume by passing the fabric dryer sheet over a
5 portion of the outer portion of the generally tubular
member.

7. The process according to claim 1, wherein the second
step of applying perfume comprises providing a set of
10 nozzles and the step of spraying perfume from the
nozzles onto the coated web.

8. The process according to claim 1, wherein the second
step is carried out by providing at least one
15 ultrasonic liquid applicator that is designed to
atomize liquid perfume.

9. The process according to claim 1, wherein the step of
applying fabric treatment ingredients comprises
20 applying ingredients selected from the group consisting
of: fabric softening agents; anti-static agents; dye
transfer inhibitors; whitening agents; enzymes; stain
repellents; wrinkle reducing agents and mixtures
thereof.

25

10. A process of applying ingredients to a fabric dryer
sheet substrate including a first step of coating at
least one ingredient onto the dryer sheet; and

30

in a second, successive step that is separate and
distinct from said first step, providing -----

- 15 -

an ultrasonic liquid applicator that atomizes and directs liquid perfume onto the dryer sheet substrate.

1/7

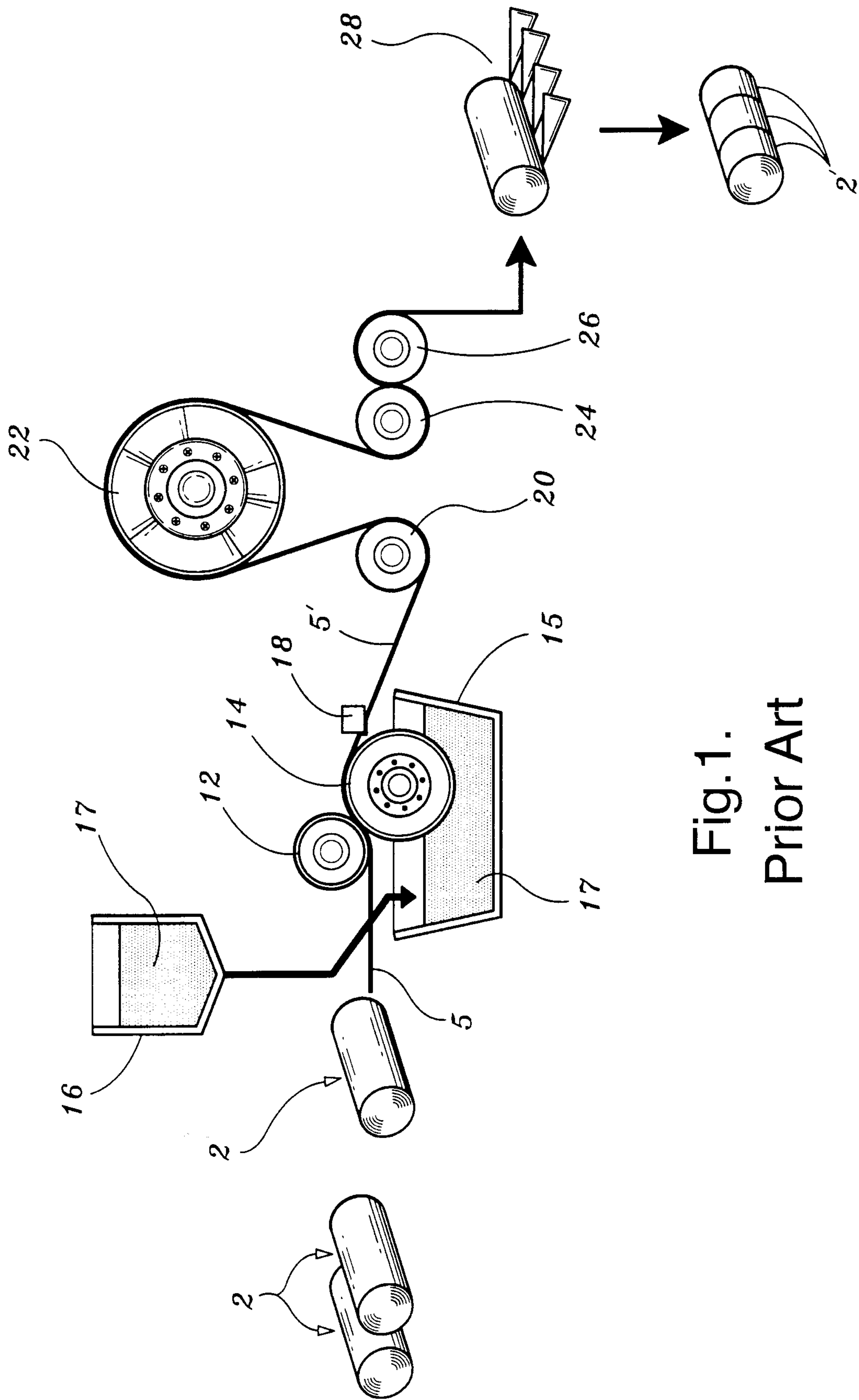


Fig.1.
Prior Art

2/7

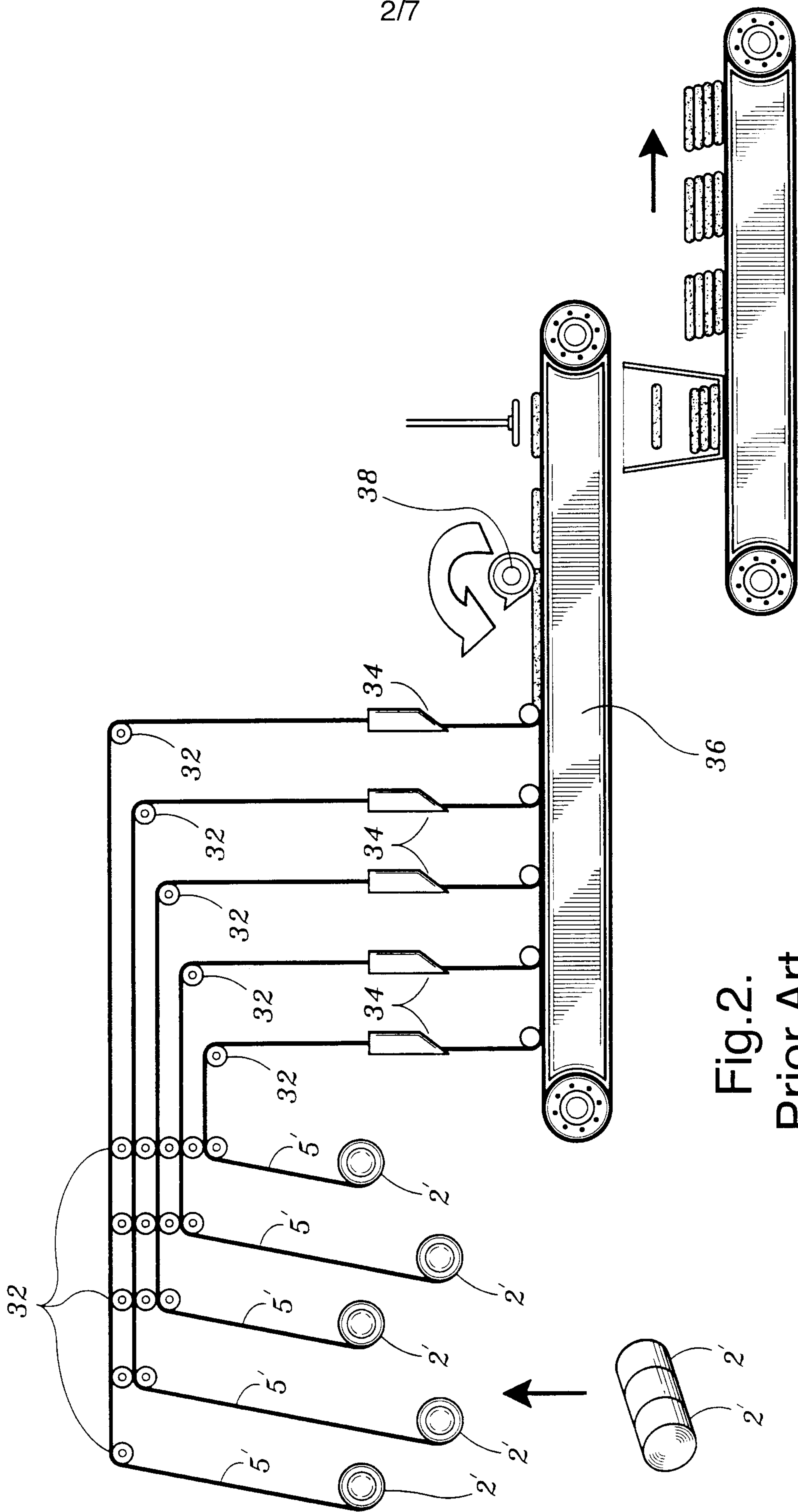


Fig. 2.
Prior Art

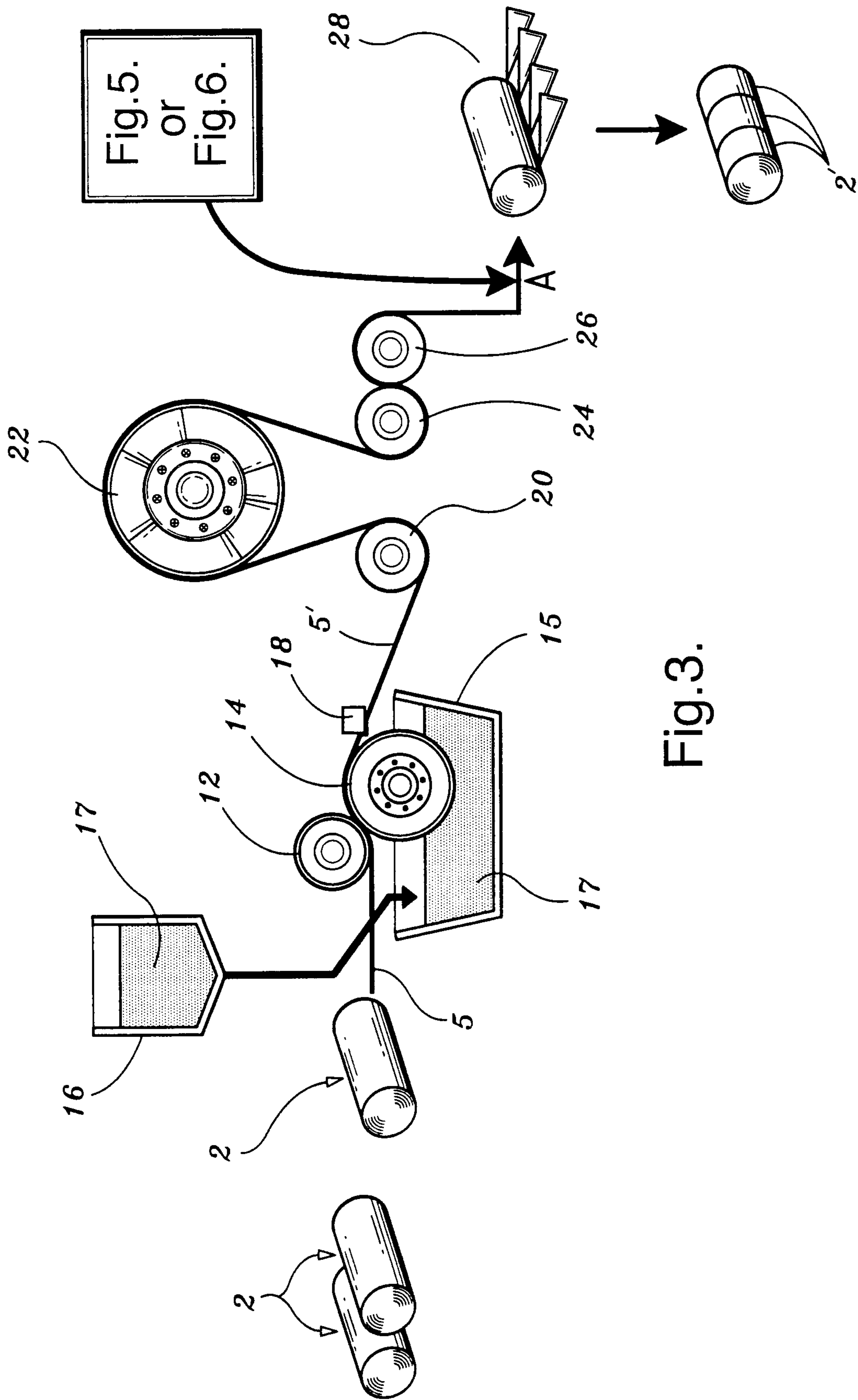
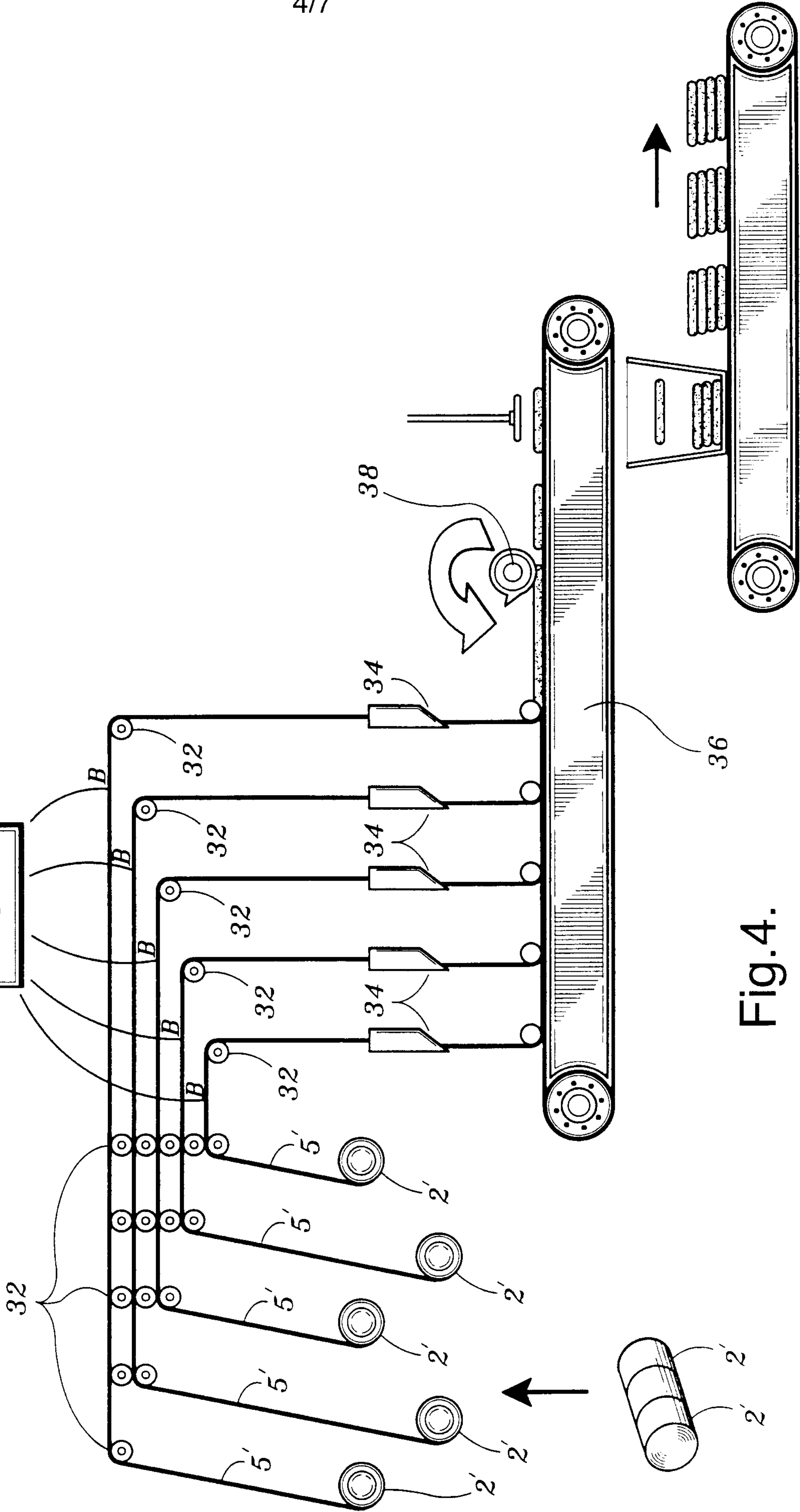


Fig.3.

Fig.5.
or
Fig.6.



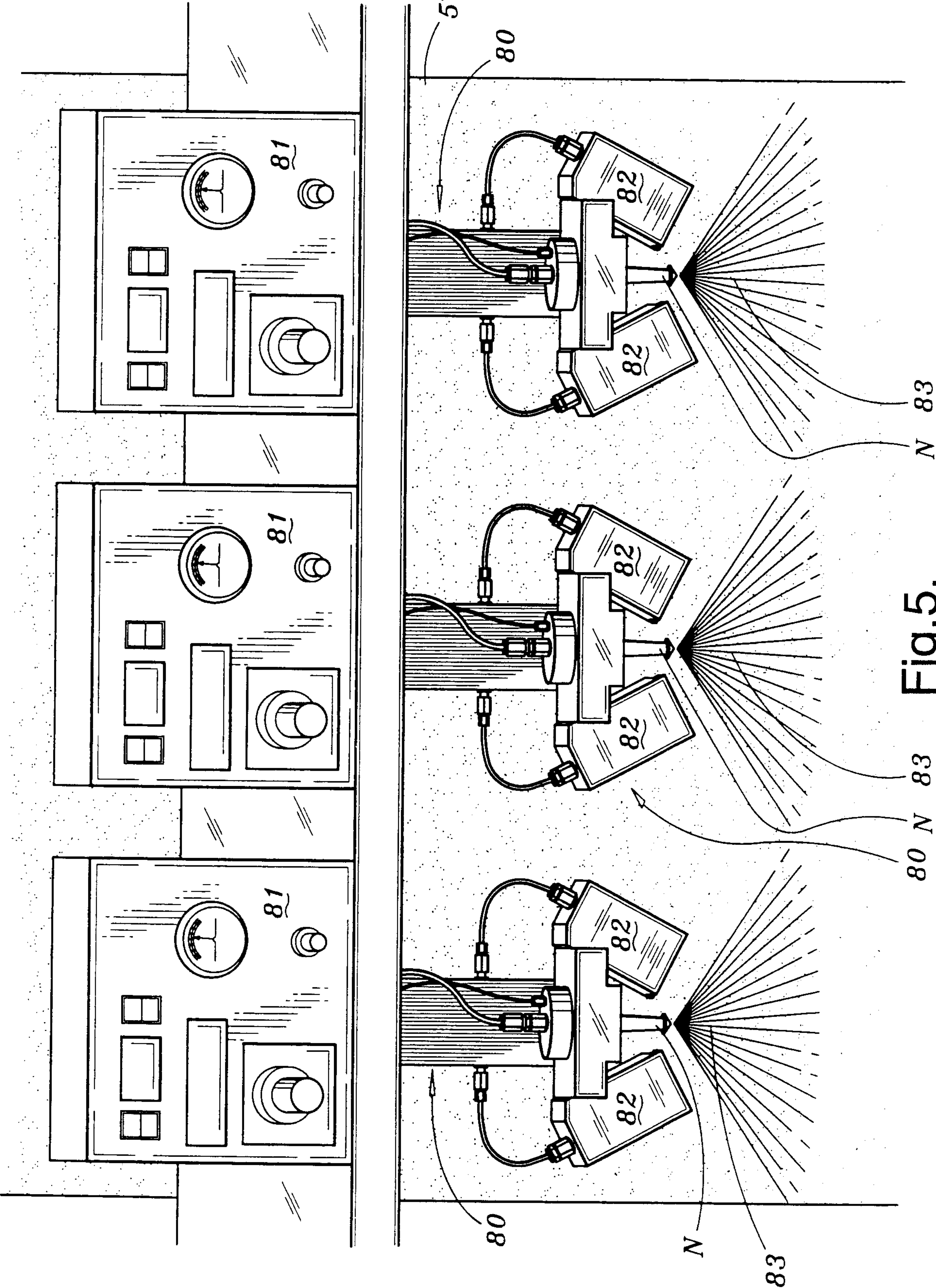


Fig.5.

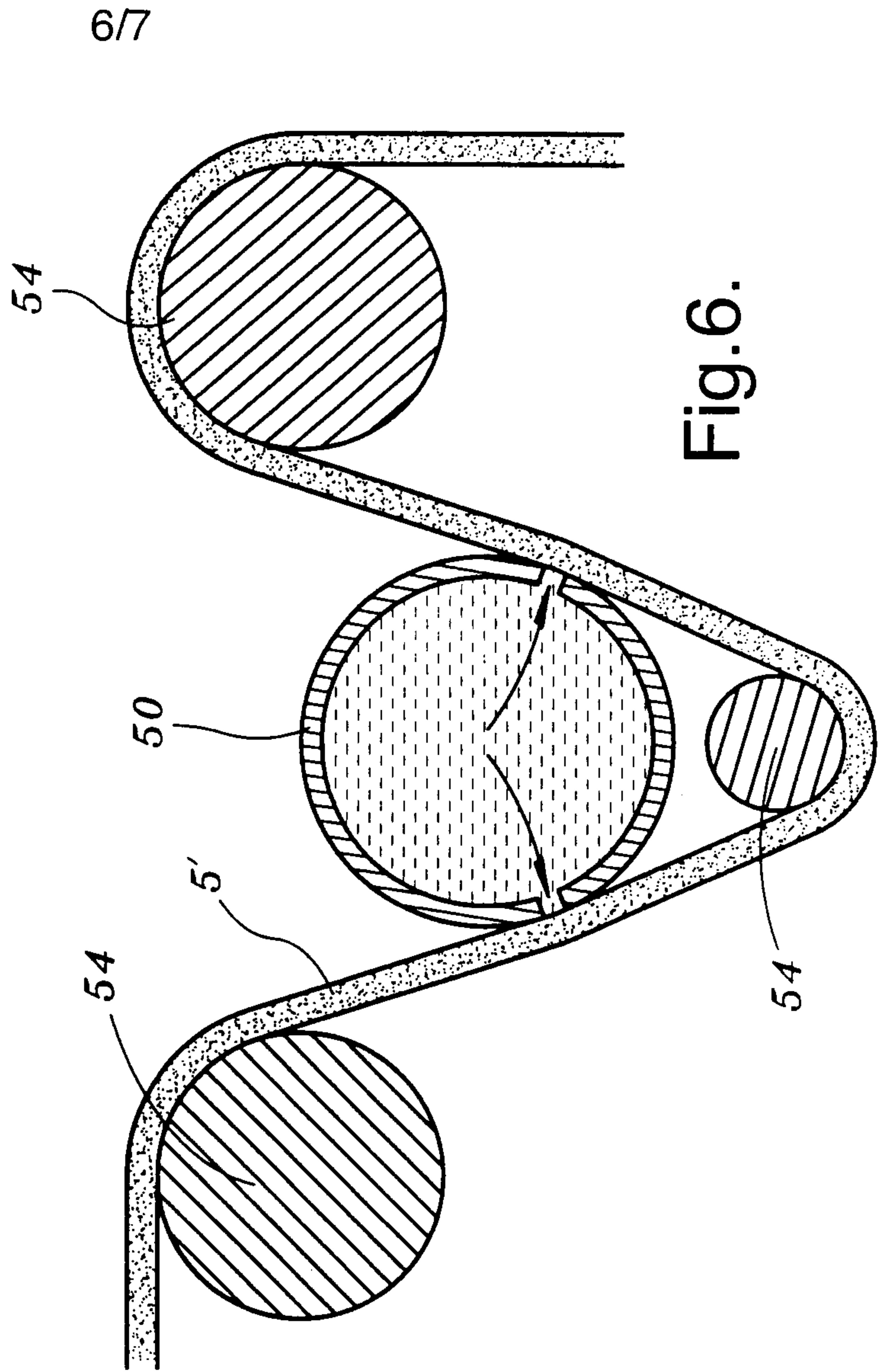
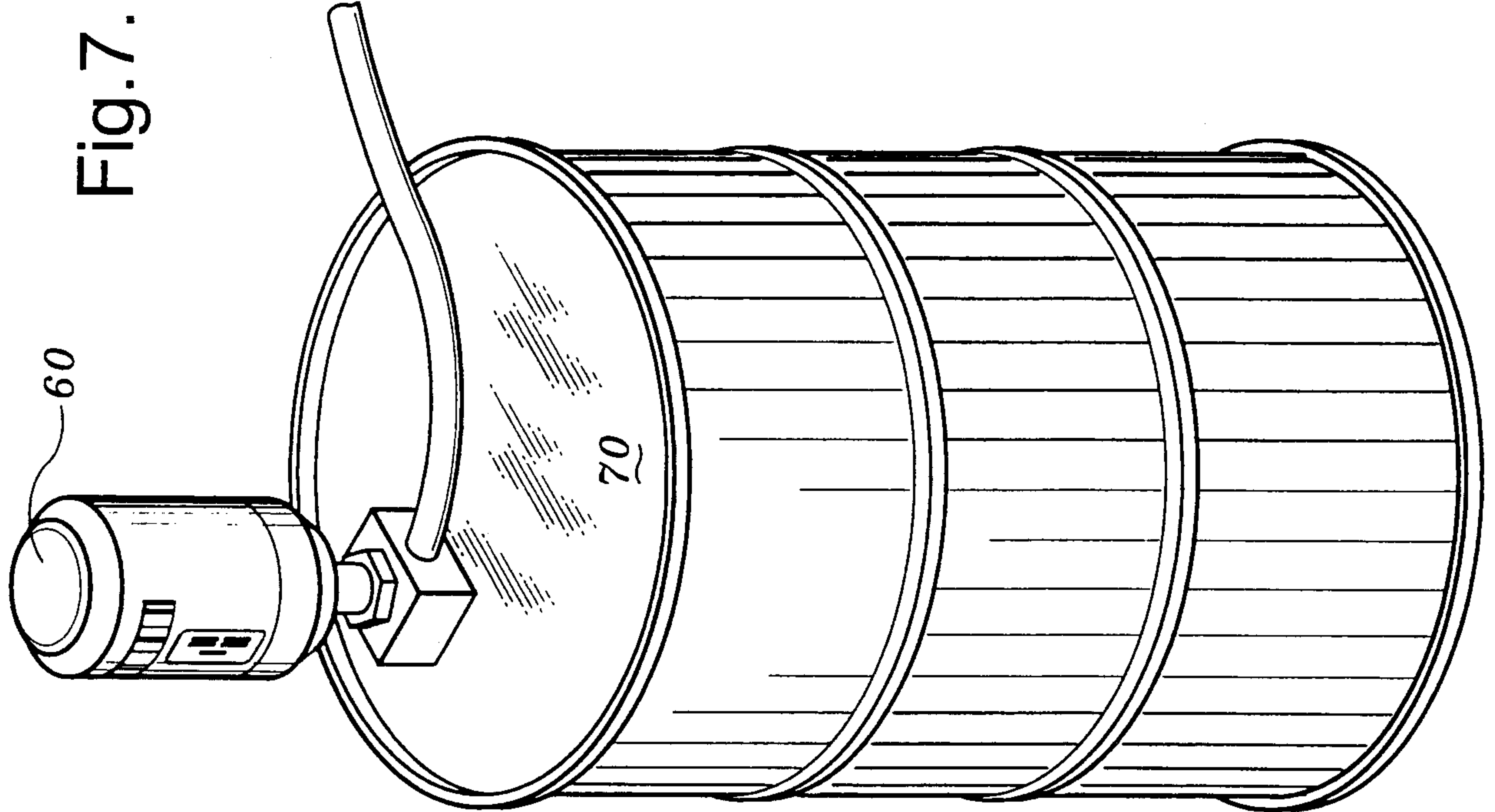


Fig. 8.

