United States Patent [19]

Charles-Massance

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[54] **PROCESS FOR INVERTING FLOW IN A CONDUIT**

[75] Inventor: **Francois Charles-Massance,** Mantes-la-Jolie, France

[73] Assignee: **Lacelluphane,** Paris, France

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Related U.S. Application Data

[62] Division of Ser. No. 264,859, June 21, 1972, Pat. No. 3,802,668.

[52] **U.S. Cl.** **264/171;** 264/188

[51] **Int. Cl.**[2] **B29F 3/10;** D01F 2/06

[58] **Field of Search** 264/349, 171, 188; 259/4

[56] **References Cited**

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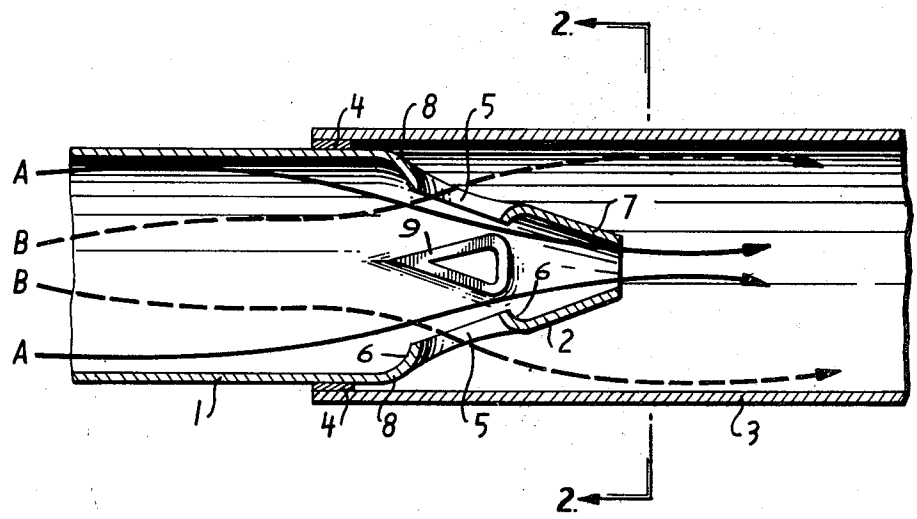
Primary Examiner—Jay H. Woo

Attorney, Agent, or Firm—Sherman & Shalloway

[57] **ABSTRACT**

A flow exchanging process for diverting a fluid flowing on the periphery of a conduit towards the center thereof and simultaneously diverting a second fluid flowing in the center of the conduit to the periphery thereof, utilizes open tapered pipe having a plurality of openings on its walls and protruding lips around each of the openings for diverting the peripheral flow towards the center of the conduit. The center flow is diverted to the periphery through the wall openings. The process is particularly adapted to use in the spinning of cellulose films from two qualities of viscose.

2 Claims, 2 Drawing Figures



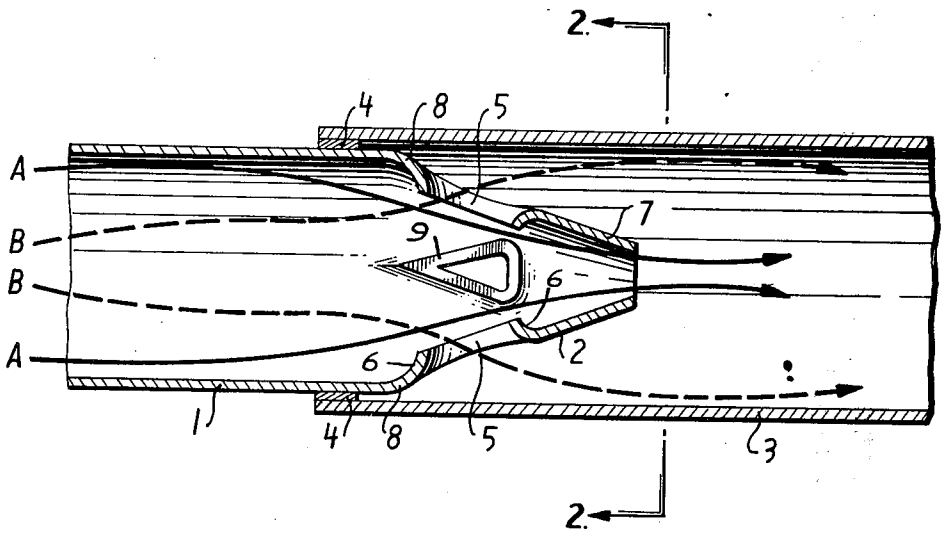


FIG. 1

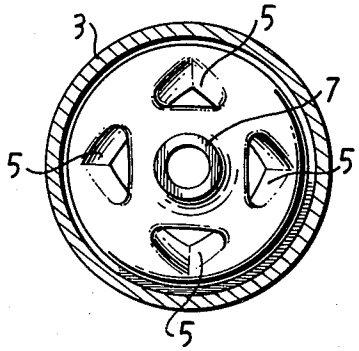


FIG. 2

PROCESS FOR INVERTING FLOW IN A CONDUIT

This is a division of application Ser. No. 264,859, filed June 21, 1972, now U.S. Pat. No. 3,802,668.

FIELD OF THE INVENTION

The present invention relates to a flow exchanging device for use in the extrusion of viscose and process using the same and more particularly for use in apparatus for spinning cellulose films to obtain improved films.

BACKGROUND OF THE INVENTION

It is known that transparent films of regenerated cellulose, widely marketed under the trademark "Cellophane" are obtained by continuous extrusion of a caustic solution of viscose through the slit of a hopper into an acid regeneration bath where the film coagulates.

In the apparatus presently in use the viscose, before reaching the hopper, travels a long path in an intake conduit, on the inside of which its travel obeys the laws of fluid mechanics, i.e., its flow can be theoretically likened to that of juxtaposed streams each having their own speed, a speed that increases from the periphery to the center. Consequently, the viscose of the peripheral streams has undergone, when it arrives in the hopper a more pronounced aging than that which traveled in the center. Since these streams do not overlap, this peripheral viscose is that which constitutes the surface zone, or skin, of the film particularly the edges.

The older, more viscous and mature viscose is of an inferior quality to that of the new or younger and more fluid viscose which circulates in the center. It is more heterogeneous and often carries gels and often results in weakened edges and irregular surface zone.

SUMMARY OF THE INVENTION

According to the present invention the above difficulties are overcome in a simple and economic manner which does not require any major modifications of existing equipment.

In this regard the previously noted drawbacks and deficiencies of the prior apparatus and processes have been eliminated in accordance with the present invention through the development of a flow inverter or exchanger particularly adapted for use in processes of spinning viscose. In this regard, the exchanger of flow inverter of the present invention is preferably made up of an extension having a truncated conical shape, open at each end, and located within the conduit means feeding the hopper and connected upstream by its larger base circumference with the inside wall of the conduit means; the truncated end or smaller base of the device is oriented downstream, with respect to the larger base, within the conduit means. The truncated conical extension is provided on its walls between the large and small base with openings tapered toward the back an enlarging in the direction of the current. The openings of this exchanger, which is generally metal, are, in addition, bent toward the inside of the cone.

The exchanger according to the present invention can be connected by any known means with the conduit means provided it extends exactly axially within the inside wall of the latter. According to one embodiment the conduit means consists of an upstream conduit and a downstream conduit. The exchanger of flow inverter is integrally formed with the upstream conduit as a single unit. This unit at the exchanger end is inserted axially within the downstream conduit. Of course, other embodiments are possible. It is not particularly necessary that the shape of the frustum of the cane be rigorously geometric but it should be tapered gradually. A similar form, slightly rounded, for example, is perfectly suitable.

The inclination of the cone frustum and the diameter of its small circumference and the position, number and dimension and shape of the lateral openings can vary and depend essentially on the relative size of the flows that are to be exchanged.

Such flow inverter is particularly adapted for use in a process for spinning cellulose films by extrudion of viscose from a hopper into a acidic coagulation bath. The flow inverter is utilized in that prior to reaching the spinning hopper, the viscose flowing through a conduit passes through the flowing inverter means whereby the viscose flowing on the periphery of the conduit is diverted to the center of the conduit and a substantial portion of the viscose flowing in the center of the conduit is diverted to the periphery. In this way it is possible to produce a cellulose film wherein the skin and edges particularly are made up of a new viscose with the core or center being composed of a more mature viscose.

The advantage of obtaining a cellulose film whose skin, and more particularly edges, are made up of a new viscose and whose core is made up of a more mature viscose lies in the importance of the edges on the regularity of the spinning operation and the importance of the skin on the surface characteristics of the film.

It is, therefore, a primary object of the present invention to provide apparatus for diverting fluid flowing through a conduit as well as a process utilizing such apparatus, specifically in the spinning of viscose wherein the process and apparatus eliminate disadvantages over previous proposals.

It is a further object of the present invention to provide a flow inverting device which will bring towards the center of the intake conduit the viscose that travels on the periphery and to move toward the periphery a part of the most fluid viscose that travels in the center.

It is a still further object of the present invention to provide an exchanger or flow inverter in the form of a tapered pipe open at both ends and having a plurality of openings on its walls, each of such openings enlarging in the direction of the small, truncated base and further each of such openings being bent inwardly at its edges to present a lip for inverting the flow within the exchanger.

These and other objects of the present invention will become apparent when read in the light of the accompanying description and drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of the exchanger device according to the present invention.

FIG. 2 is a sectional view of FIG. 1 taken along line 2—2 looking in the direction against the flow within the exchanger device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The flow exchanger of the present invention, while primarily intended for use in the formation of cellulose

films having improved surface zone and edge characteristics, is capable of being adapted to any process and apparatus where it is desired to achieve a more homogeneous product or to alter surface and edge properties. Accordingly, the accompanying drawings do not include the hopper and other equipment associated with the extrusion and spinning of cellulose films.

The operation of the flow exchanger is shown in FIG. 1 where the direction of flow is indicated by the arrows. As shown in FIG. 1 the conduit means consists of upstream conduit 1 and downstream conduit 3. Within upstream conduit 1 the flow of viscose consists of two distinct qualities represented by stream A flowing along the periphery and stream B flowing in the center of the conduit. This representation of the flow follows from the laws of fluid mechanics of viscous flow within a conduit and results primarily from the increased friction of the viscose on the conduit walls.

Integrally connected to upstream conduit 1, at the end which is inserted into downstream conduit 3, is tapered pipe 2, which, as shown is in the form of a truncated cone having its truncated end 7 extending into downstream conduit 3 and which forms the flow exchanger of the present invention. As noted earlier, it is not essential to the functioning of the flow exchanger that the shape of the tapered pipe 2 be as shown and it is possible, for example, for the tapering to be more gradual, as with slightly rounded walls. A fluid tight seal between the larger base circumference 8 of the tapered pipe 2 and the downstream conduit 3 is achieved by means of a fluid-tight ring or gasket 4. It is important that the two conduit sections and exchanger are in axial alignment.

Located on the walls of tapered pipe 2 between the base 8 and the truncated end 7 are the essentially equally spaced openings 5 which are rounded and wider at the narrow end of the pipe and gradually taper back in the direction of the larger, upstream end 8. Thus, the openings 5 widen in the direction of the flow of viscose. Each of the openings 5 is bordered by lips 6 bent towards and extending into the pipe.

It can be seen that the peripheral flow which follows the walls is directed toward the center as continuous arrows A indicate, the streams which are perpendicular to openings 5 striking lips 6 which direct them toward the center, whereas the central flow is directed, at least for a considerable fraction indicated by arrows B in broken lines, toward the periphery of downstream conduit 3 through openings 5 of the exchanger.

A plug 9 is contained in the tapered pipe 2. The plug 9 preferably expands in cross-section from its upstream end to its downstream end and terminates abruptly at its downstream end. The plug 9 serves to deflect the fluid B from the longitudinal axis of conduit 1.

The shape and taper of the openings in the inclined walls of the flow exchanger and their equally spaced position around the circumference of the pipe are shown in FIG. 2 which is taken looking at the exchanger in the direction opposed to the flow.

When used in a process for spinning cellulose films by extrusion of viscose into an acid coagulation bath through the extrusion slit of a hopper fed by an intake conduit, the flow exchanger is inserted into the intake conduit as described above.

It has been found that by using flows dyed different colors this process makes it possible to obtain films of a continuous skin of coagulated viscose of quality B on the surface of a core made up of a mixture of viscose A and B, the proportion of B present in the core varying depending on the inclination of the cone, the dimensions of its small base and further depending on the shape and distribution of the holes made in its wall.

The flow exchanger of the present invention is capable of numerous other applications in addition to forming improved cellulose films, having better homogeneity as well as improved skins and edges. It is also suitable for homogenizing any products or mixture of fluid products, including liquids in a molten or plastic state.

It is possible, for example, to produce mixtures made up of two or more different materials injected successively at different positions in the heart of the conduit means, when it is desired to obtain more homogeneous characteristics such as composition, color, taste, etc. and the successive use of several exchangers is considered to be included within the scope of the present invention.

The above description is in no way intended to limit the scope of the present invention and it is understood that various modifications and equivalents can be used which fall within the spirit and scope of the appended claims.

What is claimed is:

1. In a process for producing cellulose films by extrusion of viscose from a hopper into an acidic coagulation bath, wherein the viscose is fed to the hopper through conduit means extending along a longitudinal axis while being contained by the inner periphery of the conduit means, the improvement comprising the steps of:

diverting the viscose flowing adjacent to the inner periphery of the conduit means toward the longitudinal axis of the conduit means, while simultaneously diverting a substantial portion of the viscose flowing adjacent to the longitudinal axis toward the inner periphery of the conduit; and then

containing the diverted viscose flows downstream of said diversions in an inverted state.

2. In a process for producing cellulose films by extrusion of viscose from a hopper into an acidic coagulation bath, wherein the viscose is fed to the hopper through conduit means extending along a longitudinal axis while being contained by the inner periphery of the conduit means, the improvement comprising the steps of:

diverting the viscose flowing adjacent to the inner periphery toward the longitudinal axis of the conduit means by decreasing the cross-sectional area defined by the inner periphery while simultaneously increasing the cross-sectional area of a plug within said conduit;

releasing the viscose downstream of the plug;

diverting simultaneously the viscose flowing adjacent to the longitudinal axis toward the inner periphery by flowing the viscose through openings in said conduit as said cross-sectional area decreases while deflecting the viscose flowing adjacent to the inner periphery away from said openings toward the longitudinal axis; and then

containing the viscose flows downstream in an inverted relationship created by the afore-cited diversions.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,911,073 Dated October 7, 1975

Inventor(s) Francois Charles-Massance

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading:

Please change the assignee to read as follows
-- La Cellophane --

Insert -- Foreign Application Priority Data
French Patent No. 7,123,581 --

Signed and Sealed this

seventeenth Day of *February 1976*

[SEAL]

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Attesting Officer

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