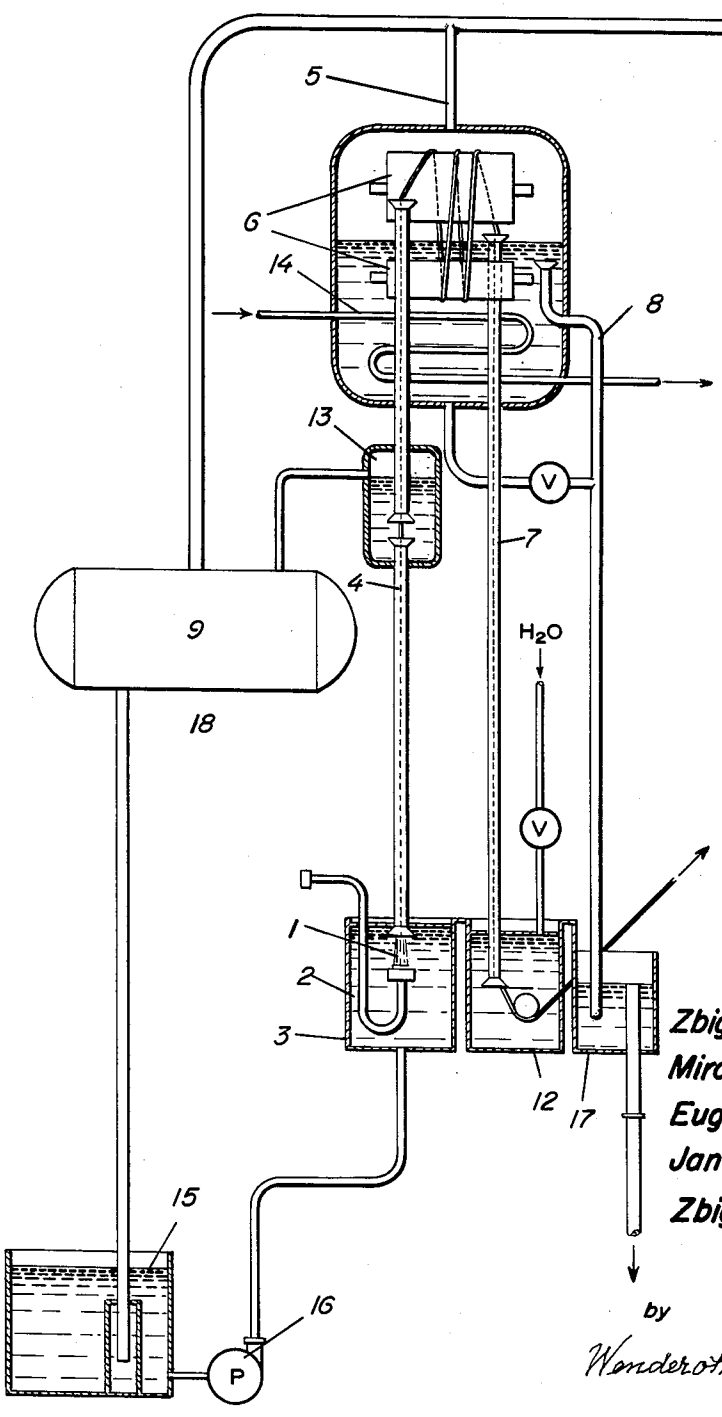
June 25, 1963 Z. RYBICKI ETAL 3,094,742

APPARATUS FOR SPINNING VISCOSE FIBERS

Filed Nov. 14, 1960 3 Sheets-Sheet 1

FIG 1



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Filed Nov. 14, 1960 3 Sheets-Sheet 2

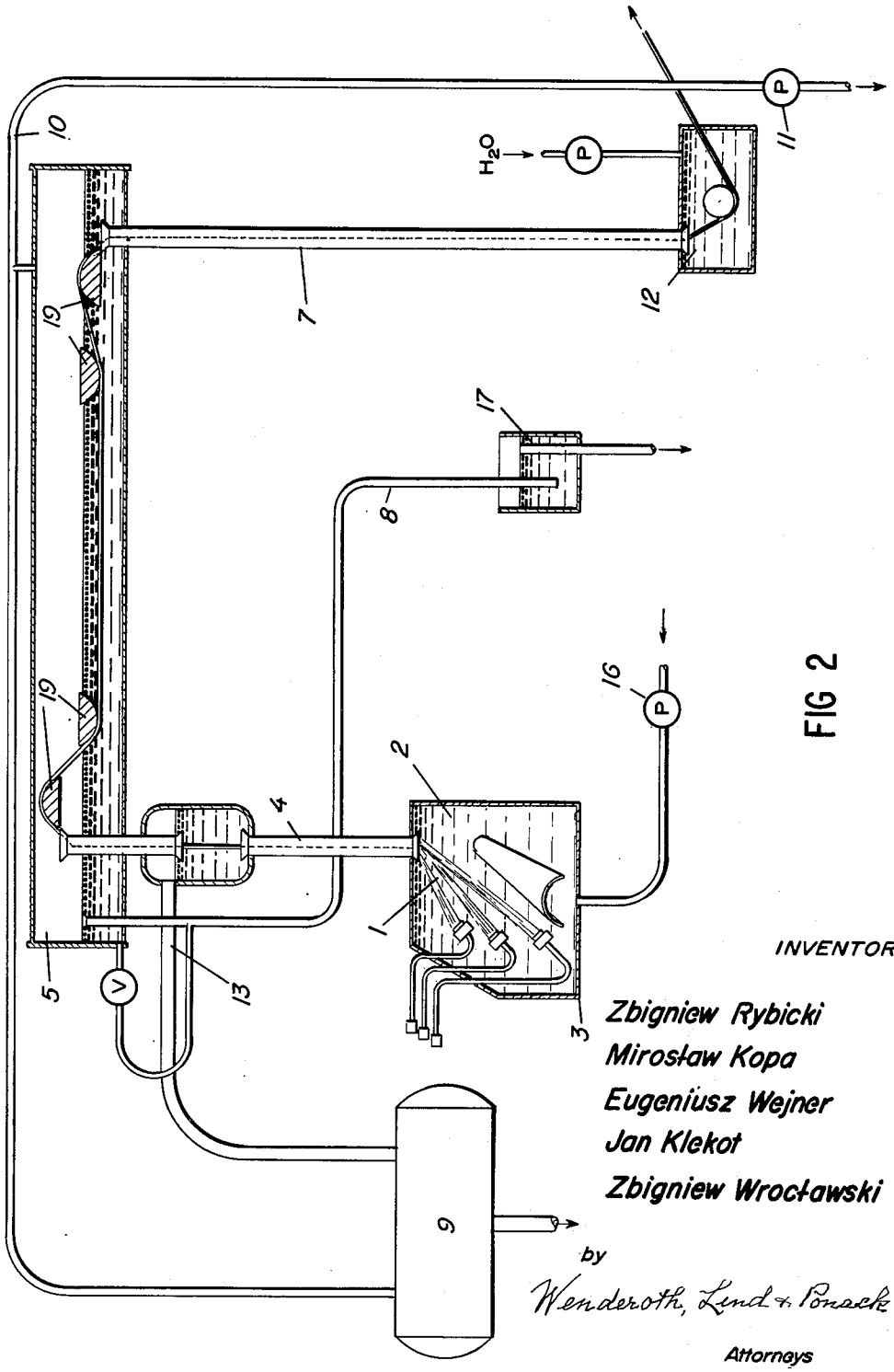

FIG 2

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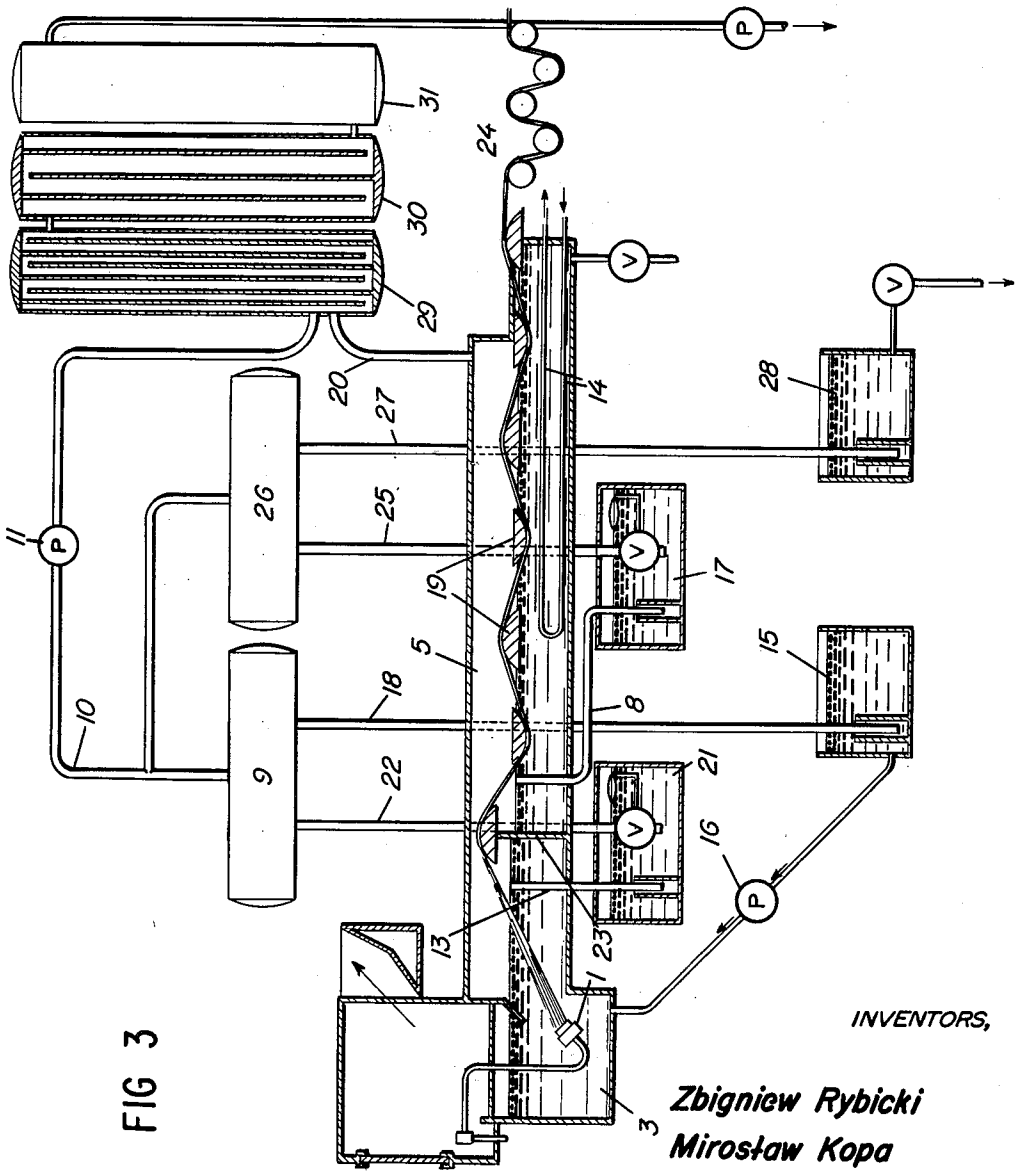

FIG 3

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APPARATUS FOR SPINNING VISCOSE FIBERS

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The invention refers to a method of spinning artificial fibres of the spinning solution, especially viscose rayon fibres, and to an apparatus for carrying out the method.

There are already known staple fibre spinning machines in which the gases escaping during the process of producing fibres or the vapours of solvents used for the preparation of the spinning solution are conveyed to absorbing and regenerating devices, while the fibre uncompletely freed from gases and volatile solvents is led to the degasifier. The process takes place under normal pressure or under overpressure. From among known hermetic staple fibre spinning machines in which the fibre-degassing process is uncompletely accomplished, the staple fibre spinning machine according to Polish Patent No. 31,115 may be mentioned. The fibre produced in this spinning machine still containing volatile poisonous components, such as CS_2 and H_2S, is conveyed to degasifiers in which the viscose-decomposition process and the degasification of the fibre are brought to an end. A disadvantage of the solutions of known devices is the fact that the spinning bath is saturated with sulphur-containing gases whereby the attendants of the machine are exposed to the noxious action of sulphur compounds. Beyond this, the conveyance of the fibre together with the sulphur compounds to the degasifier causes losses of carbon disulphide and sulphuretted hydrogen which evaporate from the band to the atmosphere.

The method according to the invention consists in that the artificial-fibre spinning process is conducted in a closed space in which the complete decomposition of the spinning liquid and the removal of sulphur-containing gases to the condensing and absorbing devices take place, whereupon the already degasified fibre is removed from the closed space across the hydrostatic closure.

The method according to the invention admits the entire regain of volatile sulphur compounds arising during the decomposition of viscose, allowing thereby a considerable decrease of the use of essential raw-products. Beyond this, the viscose factories working according to the method of the invention, are no more troublesome to the environs, their exploitation is considerably cheaper and they require less investment expenses for ventilation devices of the spinning sections, for spinning-gas absorbers, for devices destined for cleaning the gutters from sulphur-containing gases and for dispersing the volatile poisonous substances in the atmosphere.

For carrying out the method according to the invention, use is made of contrivances schematically shown by way of an example in FIGS. 1, 2, and 3.

In the device according to the invention, schematically shown in FIG. 1, the spinning solution is brought to the spinning nozzle 1 immerged into the spinning bath 2 being in the container 3. Into the spinning bath 2 is immerged a barometric pipe 4 connected to a vacuum container 5 in which the store-rolls 6 are mounted. In consequence of the fact that the rate of removing the sulphur compounds from the fibre depends on the temperature and the use of higher temperatures for the spinning baths is confined by technological reasons, a water bath having a higher temperature than the spinning bath may be additionally used as a heat carrier. For this purpose the fibre band leaving the barometric pipe 4

which is filled with spinning bath and is provided with an overflow 13, is introduced into the vacuum chamber 5 in which a heater 14 is mounted enabling the degassing bath to be maintained at a temperature surpassing that of the spinning bath. It is advisable that the concentration of the sulphuric acid carried over together with the fibre band into the degassing bath be lower than 10 g./litre, because otherwise the rate of removing the sulphur compounds becomes lower. From the store-rolls 6 the degasified fibre band is brought through the barometric pipe 7 immersed into the water container 12, to the further known finish treatment. The spinning bath passes through the overflow 13 to the gasifier 9 filled with Raschig rings, whereupon it flows through a hydrostatically closed conduit 18 into the vat 15. From the vat 15 the bath is conveyed, after its losses have been filled up, by means of a pump 16 into the container 3, where spinning takes place. The degassing bath flows across the hydrostatic closure through the conduit 8 into the chamber 17. The column of the water contained in the pipes 4 and 7 constitutes a hydraulic closure of the underpressure formed in the container 5. The container 5 is connected by a conduit to the degasifier 9 of the spinning bath. The gases and vapours escaping during the degassing process of the fibre and of the spinning bath are sucked off from the containers 5 and 9 through the conduit 10 by means of a vacuum pump 11 pressing them into the condensing and absorbing devices. For the complete removal of the volatile sulphur compounds from the fibre band, it is necessary to store in the apparatus according to the invention a convenient quantity of fibre band. This quantity depends in rather large limits on the temperature of the spinning bath, on the temperature of the water bath and on the spinning rate of the fibre. For simplifying the course of the band, in the apparatus according to the invention instead of store-rolls 6 mounted in the vacuum container, use may be made of sliding surfaces of porcelain or the like, decreasing the resistances and admitting the avoidance of troublesome winding of the fibre band on the rolls. The fibre band is led in a vacuum degassing chamber of a length which assures a full removal of volatile sulphur compounds at a convenient water-bath temperature and spinning rate of the fibre.

The modification of the apparatus according to FIG. 2 consists of spinning nozzles 1 immerged into the spinning bath 2 in the container 3. As the sulphur-containing gas bubbles do not escape from the spinning bath immediately after the spinning-liquid stream meets the spinning bath, it is not unnecessary to place the nozzles directly under the pipe which closes the fibre-degassing space, but only in such a distance in which the separation of gas bubbles does not yet take place.

The band of the formed fibre is introduced into the chamber 5 through the barometric pipe 4 which is filled with spinning bath and is provided with an overflow 13 through which the bath flows into the degasifier 9. From the gasifier 9 the spinning bath flows through a hydrostatically closed conduit 18 into a vat (not shown in FIG. 2) wherefrom the bath, after its losses have been filled up, is conveyed by means of the pump 16 into the container 3 where spinning takes place.

In the chamber 5 partly filled with water bath heated to a temperature surpassing that of the acid bath, underpressure is maintained. The sliding members 19 lead the band alternately in the water bath or in the free space. From the container 5 the fibre band is conveyed through the pipe 7 closing hydrostatically the degassing bath into the container 12 and subsequently to further finish treatment. For the purpose of additionally decreasing the resistance, the pipe 7 closing hydrostatically the water bath, may be led vertically or obliquely. The degassing

bath flows across the hydrostatic closure through the conduit 8 into the chamber 17. The pump 11 conveys through the pipe 10 the volatile sulphur compounds from the free space of chamber 5 and from the degasifier of the bath 9 into the absorbing and condensing devices.

FIG. 3 illustrates a modification of the apparatus in which the spinning process of the fibre and its degasifying take place in one horizontal pipe. The spinning liquid is directed to the spinning nozzle 1 which is immerged into the spinning bath 2 being in the container 3. The band of the freshly formed fibre is led by the sliding surfaces 19 to the degassing chamber 5 which is hydrostatically closed by the overflow 13 of the spinning bath and by the conduit 8 of the degassing bath. The baths in the chamber 5 are separated from each other by a partition 23. The degassing bath may simultaneously be a bath of special technological action, e.g. a plastifying bath or a bath conferring curliness to the fibre. The temperature of the degassing bath is higher than that of the spinning bath. For filling up the heat losses caused by the evaporation of sulphur-containing gases, in the inside of the chamber a heater 14 supplied with steam or with hot water is mounted. After full degasification the fibre band is led out across the hydraulic closure between both the end sliding surfaces. The band guide 24 conveys the fully degasified and partly rinsed fibre band to further known finish operations. After the fibre-forming process the spinning bath flows through the overflow 13 into the hydraulically closed container 21. From the container 21 the bath is conveyed through the barometric pipe 22 into the vacuum degasifier 9 which is filled with Raschig rings. The spinning bath completely freed under vacuum from sulphur compounds, flows through a hydrostatically closed conduit 18 into the vat 15. From the vat 15 the bath is conveyed, after its losses have been filled up, by the pump 16 into the container 3 where spinning takes place.

From the chamber 5 the degassing bath flows through the conduit 8 into the hydraulically closed container 17 from which it is conveyed through the barometric pipe 25 into the degasifier 26 which is filled with Raschig rings. The degassing bath fully freed under vacuum from sulphur compounds flows through the hydrostatically closed conduit 27 into the vat 28. Depending on its destination and on its composition the said degassing bath may flow into the channel or it may circulate in a closed circuit.

The degasifiers 9 and 26 are connected to the vacuum pump 11 through the conduit 10. The vacuum pump 11, preferably a ring water pump, working at a temperature surpassing the boiling temperature of carbon disulphide, presses the sulphur-containing gases into the condensing and absorbing devices 29, 30, 31 to which are also led the sulphur-containing gases from the degassing chamber 5 by means of the conduit 20. In the chamber 5 and in the conduit 20 there is underpressure of the order of from some to nineteen cm. of the water column, said underpressure being necessary for directionally conveying the gases into the condensing and absorbing devices.

We claim:

1. An apparatus for spinning viscose fibers comprising a first container containing a spinning bath, spinning nozzles in said first container immersed in said spinning bath, a second container containing a degassing bath, a barometric pipe connected to said second container through which run the fibers, said degassing bath being hydrostatically closed, a degasifier, an overflow for said barometric pipe through which said circulating spinning bath passes to said degasifier, a hydrostatically closed circuit from said degasifier through which said spinning bath flows, a vat for receiving said spinning bath in said closed circuit, a pump for returning said spinning bath to said first container, a heater for said fibers, rollers upon which said fibers to be degasified are wound, a second barometric pipe hydrostatically enclosed through which said fibers are lead, a water container for receiving said fibers from said second barometric pipe, a conduit connected to said second container through which said degassing bath flows, a chamber for receiving said degasifying bath, a suction pump for maintaining a vacuum in said apparatus and removing the gases from said second container.

2. An apparatus as set forth in claim 1 wherein sliding members are provided in said degasifier.

3. An apparatus as set forth in claim 1 wherein said degasifier is horizontally mounted and means are provided for leading the gases therefrom to condensing and absorbing devices.

4. An apparatus for spinning viscose fibers comprising a horizontal degassing chamber, a heater located in said chamber, members over which the fibers may slide located in said chamber, means for placing said chamber under atmospheric pressure, said chamber comprising a spinning bath and a degassing bath hydrostatically closed, a partition in said chamber separating said spinning bath and said degassing bath, a first container for receiving excess liquid from said spinning bath, a first degasifier connected to said first container, a vat, said first degasifier also being connected to said vat by means of a hydrostatically closed circuit, a second container hydrostatically closed into which said degassing bath flows, a second degasifier connected to said second container, a vat, said second degasifier also being connected to said vat by means of a hydrostatically closed circuit, a fiber guide along which the degasified fibers upon leaving said degassing chamber are fed, a vacuum pump, a conduit connecting said degasifiers to said vacuum pump for maintaining sub-atmospheric pressure therein and conveying the gases to condensing and absorbing devices, said gases from said degassing chamber also being fed to said devices.

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