Appeal decision

Appeal No. 2017-12323

Tokyo, Japan
Appellant SUMITOMO CHEMICAL CO., LTD.

Patent Attorney SAMEJIMA, Mutsumi

Patent Attorney YOSHIDA, Tamaki

The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2016-206227, entitled "method and apparatus for manufacturing polarizing films" (the application published on October 5, 2017, Japanese Unexamined Patent Application Publication No. 2017-182035) has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

1 History of the procedures

The application of the case of appeal against the examiner's decision of refusal (hereinafter, the "application of the case") was filed on October 20, 2016 (Priority date: March 28, 2016), reasons for refusal were notified on January 31, 2017, a written opinion and a written amendment were submitted on March 14, 2017, and a decision of refusal was issued on May 29, 2017.

As a complaint against the decision of refusal, an appeal against the examiner's decision of refusal was made on August 21, 2017, reasons for refusal were notified on July 25, 2018 by the Body, and a written opinion and a written amendment were submitted on September 25, 2018.

2 Invention according to claim 1

It is acknowledged that inventions according to claims 1 to 4 of the application are specified with matters described in claims 1 to 4 after amendment by the written amendment filed on September 25, 2018, and the description in claim 1 is as follows:

"A method for manufacturing a polarizing film by subjecting a polyvinyl alcohol-based film to swelling treatment and dyeing treatment in sequence, wherein

the swelling treatment is carried out by causing the polyvinyl alcohol-based film to pass through n (n is a natural number not smaller than 2) swelling tanks in sequence,

the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n-1)$) swelling tank, and

the swelling treatment is carried out maintaining the TOC concentration in the swelling tanks at 1500 ppm or lower" (hereinafter, "the invention").

3 Overview of the reasons for refusal notified by the Body

Outline of reasons for refusal notified on July 25, 2018 by the body are as follows:

(1) Reason 1 (Violation of the support requirement)

Since the inventions according to claims 1 to 4 of the application are not inventions described in the Detailed Description of the Invention in the specification of the application (hereinafter, the "Specification"), the description in the Claims of the application does not comply with the requirement set forth in Article 36(6)(i) of the Patent Act.

(2) Reason 2 (Lack of inventive step)

Since the inventions according to claims 1 to 4 of the application are such that they could have been easily invented by a person skilled in the art based on matters disclosed in cited document 1 (Japanese Unexamined Patent Application Publication No. 2007-51166) and cited document 2 (Japanese Unexamined Patent Application Publication N. 2014-197050), they are not patentable under the provisions in Article 29(2) of the Patent Act.

4 Judgement on Reason 1 (Violation of the support requirement)

(1) Description in the Detailed Description of the Invention in the Specification

Description in the Detailed Description of the Invention in the Specification has the following descriptions with respect to the problem to be solved by the invention and a means for solving the problem (Underlines denote portions that are especially relevant to "(2) Matters grasped from the description in the Detailed Description of the Invention" below.)

A "[Technical field]

[0001]

The invention relates to a method and apparatus for manufacturing a polarizing film.

[Background Art]

[0002]

In the past, a method for manufacturing a polarizing film was disclosed in Japanese Unexamined Patent Application Publication No. 2004-125816 (patent document 1). In this method for manufacturing polarizing film, the polarizing film was manufactured by subjecting polyvinyl alcohol-based film to swelling treatment and dyeing treatment in sequence.

... (Omitted) ...

[Problem to be solved by the invention]

[0004]

The inventor of the invention of the application has been carrying out research on methods for manufacturing conventional polarizing film as described above. As a result, the inventor of the invention of the application focused attention on generation of foam in the swelling tank used for swelling treatment. It was found that, if excessive foam is generated, foam adheres to the polyvinyl alcohol-based film that passes through

the swelling tank, and there is a risk of occurrence of defects in polarizing film caused by dirt adhered to the polyvinyl alcohol-based film due to foam.
[0005]

Therefore, the problem to be solved by the invention is to provide a method and apparatus for manufacturing polarizing film in which adherence of dirt to polyvinyl alcohol-based film is reduced, and occurrence of defects in polarizing film caused by dirt can be reduced" by effectively suppressing generation of foam in the swelling tank."

B [Means for solving the problem]
[0006]

For solving the problem, the method for manufacturing polarizing film of the invention is:

A method for manufacturing polarizing film by subjecting polyvinyl alcohol-based film to swelling treatment and dyeing treatment in sequence, wherein

the swelling treatment is carried out by passing polyvinyl alcohol-based film through n (n is a natural number) swelling tanks in sequence, and

the swelling treatment is carried out by maintaining the TOC concentration in the swelling tank at 10000 ppm or less.
[0007]

According to the method for manufacturing polarizing film of the invention, since the swelling treatment is carried out maintaining the TOC concentration in the swelling tank at 10000 ppm or less, generation of foam in the swelling tank can be effectively suppressed, and adherence of foam to the polyvinyl alcohol-based film while the latter passes through the swelling tank can be reduced. Accordingly, adherence of dirt to polyvinyl alcohol-based film caused by foam can be reduced, and occurrence of defects in the polarizing film caused by dirt can be reduced.
[0008]

In an embodiment of the method for manufacturing polarizing film,

n is 2 or more,

the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n-1)$) swelling tank.
[0009]

According to the embodiment, since the temperature of n-th swelling tank is not higher than the temperature of k-th swelling tank, in the n-th swelling tank in which the temperature is low, the plasticizer becomes difficult to elute from polyvinyl alcohol-based films, and suppression of generation of foam can be carried out further reliably."

C [Advantage of the Invention]
[0016]

According to the method and apparatus for manufacturing the polarizing film of the invention, by effectively suppressing generation of foam in the swelling tank, adherence of dirt to polyvinyl alcohol-based film can be reduced and occurrence of defects in polarizing film caused by dirt can be reduced."

D [Brief description of drawings]

[0017]
[FIG. 1] is a simplified schematic diagram that shows an embodiment of the apparatus for manufacturing the polarizing film of the invention."

E [Description of Embodiments]
[0018]
Hereinafter, the invention is explained in detail with the illustrated embodiment.
[... (Omitted) ...]
[0020]
With the method for manufacturing polarizing film, a polarizing film 3 is manufactured by subjecting a PVA-based film 2 to swelling treatment and dyeing treatment in sequence. The swelling treatment is carried out by causing the PVA-based film 2 to pass through two swelling tanks 11 and 12 in sequence, and the TOC concentration in swelling tanks 11 and 12 is maintained at 10000 ppm (mg/L) or less during the swelling treatment. The method for manufacturing polarizing film can be carried out without being limited to the configuration of the apparatus for manufacturing a polarizing film 5 in FIG. 1.
[0021]
According to the method for manufacturing polarizing film 5, since the swelling treatment is carried out while maintaining the TOC concentration in the swelling tanks 11 and 12 at 10000 ppm, generation of foam in the swelling tanks 11 and 12 can be effectively suppressed, and, while the PVA-based film 2 passes through the swelling tanks 11 and 12, adherence of foam to the PVA-based film 2 can be reduced. Accordingly, adherence of dirt to the PVA-based film 2 because of foam is also reduced, and occurrence of defects in the polarizing film 3 because of dirt can be reduced.
[0022]
To the contrary, if swelling treatment is carried out with the TOC concentration in swelling tanks 11 and 12 over 10000 ppm, generation of foam increases in swelling tanks 11 and 12 and there is a risk that foam adheres to the PVA-based film 2 that passes through the swelling tanks 11 and 12. As a result, dirt adheres to the PVA-based film 2 caused by foam, and the polarizing film 3 tends to have defects.
[0023]
In short, the inventor of the invention of the application found out the relationship between the TOC concentration in the swelling tanks 11 and 12 and foaming in swelling tanks 11 and 12, the relationship between adherence of foam to the PVA-based film 2 and adherence of dirt to the PVA-based film 2, and the relationship between adherence of dirt to PVA-based film 2 and occurrence of defects in the polarizing film 3, and thereby completed the invention.
[0024]
Preferably, there are n (n is a natural number not smaller than 2) swelling tanks, and the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n-1)$) swelling tank. Namely, the temperature of the swelling tank furthest downstream in the carrying direction is not higher than the temperature of other swelling tanks. As explained above, since the temperature of the n-th swelling tank is not higher than the temperature of the k-th swelling tank, in n-th swelling tank in which the temperature is low, the plasticizer becomes difficult to elute from the polyvinyl alcohol-based film 2,

and suppression of generation of foam can be carried out further reliably.

F "[Examples]
[0059]

Hereinafter, Examples of the invention are explained, but the invention is not limited by those Examples.

(Example 1)
[0060]

In Example 1, 20°C pure water was impregnated into a PVA-based film to extract plasticizers such as glycerin and polyvinyl alcohol, and, by adjusting the amount of PVA-based film to which pure water was impregnated, solutions with different TOC concentrations were prepared. Liquids with different TOC concentrations were sampled in 110 ml vial containers in an amount of 50 ml for each vial container and violently agitated in the vertical direction. The heights of forming after 5 minutes were recorded. The relation between the TOC concentration (ppm) and the foaming height (mm) is shown in Table 1 and FIG. 2. For measuring the TOC concentration, Shimadzu-made TOC-V. CPH was used.
[0061]
[Table 1]

TOC濃度(ppm)	泡立ち高さ(mm)
303	7
654	10
2193	12
5239	12
6972	12
8782	12
10329	14
11339	14
17352	14

TOC 濃度 TOC concentration
泡立ち高さ Foaming height

[0062]

As shown in Table 1 and FIG. 2, it was found that there was a difference in forming height between 700 ppm and 2100 ppm, and between 8800 ppm and 10000 ppm. Namely, at 2100 ppm or less, the foaming height abruptly became lower, and, between 2100 ppm to 8800 ppm, the foaming height was more or less constant, and, over 10000 ppm, foaming height abruptly increased.

(Example 2)
[0063]

In Example 2, solutions with different TOC concentrations were prepared in the same method as in Example 1. Foaminess (ml) and foam stability (ml) were measured for liquid samples with different TOC concentrations in accordance with JIS K 2518 method for foaming test. The test was carried out with the amount of sample 150 ml, at 24°C. The relation among the TOC concentration (ppm), foaminess (ml), and foam

stability(ml) is shown in Table 2.
[0064]

Foaminess is measured as the volume (ml) of foam immediately after completion of 5-minute air blowing at the specified temperature (24℃). Foam stability is measured as the volume (ml) of foam after being left as is for 10 minutes after measuring foaminess. TOC concentration of solutions with different TOC concentration was measured by the method in JIS K010120.1 Total organic carbon quantitative method (Determination of TOC by Combustion Oxidation Infrared Spectrometry).
[0065]
[Table 2]

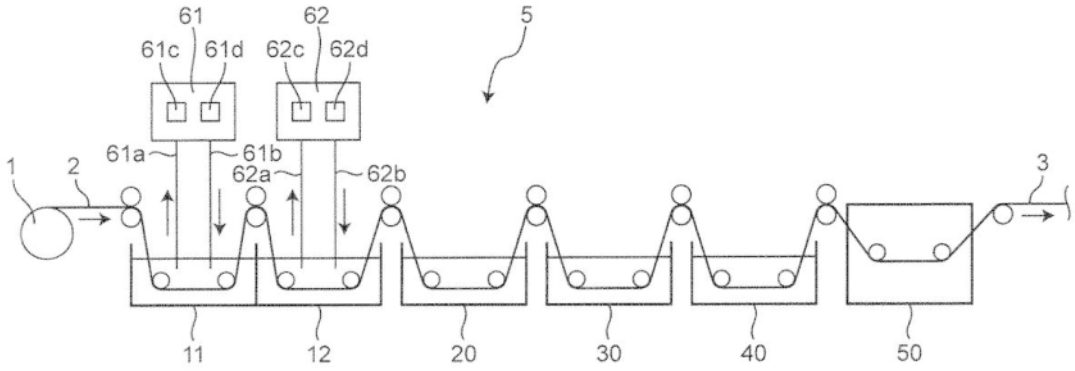
ＴＯＣ濃度（ｐｐｍ）	泡立ち度（２４℃）	泡安定度（２４℃）
５５００	２３０	１６０
３６００	５０	３０
２７００	３０	１０
１８００	５０	１０
１１００	０	０

TOC 濃度 TOC concentration
泡立ち度 Foaminess
泡安定度 Foam stability

[0066]

As shown in Table 2, it was found that there are differences in foaminess and foam stability between 1100 ppm and 1800 ppm, and between 3600 ppm to 5500 ppm.
[0067]

According, as seen in Example 1 (Table 1) and Example 2 (Table 2), the foaming height and foaminess can be suppressed at 10000 ppm or less. As a result, at 10000 ppm or less, occurrence of foaming can be reduced. If TOC is reduced to 3600 ppm or less, 2100 ppm or less, and below 1800 ppm, occurrence of foaming can be further suppressed. The adherence of dirt to PVA-based films can be reduced and occurrence of defects in the polarizing films can be reduced. In contrast to this, If TOC exceeds 10000 ppm, the foaming height and foaminess abruptly increase. As a result, over 10000 ppm, occurrence of foaming increases and there is a risk that dirt adheres to PVA-based films and causes defects in polarizing films."
G "[FIG. 1]



"

(2) Matters grasped from the description in the Detailed Description of the Invention
A From the description summarized in above (1), A (particularly, [0005]), it is understood that the problem to be solved by the invention is to provide a method for manufacturing polarizing films that makes it possible to reduce occurrence of defects in polarizing films caused by dirt.

In addition, from the description summarized in above (1), B, and the description in claim 1 shown in above 2, it is understood that, in order to solve the above problem, the invention specifically adopted a means to "carry out swelling treatment maintaining the TOC concentration in the swelling tank at 1500 or less" (hereinafter, the "first means for solving the problem") and a means, "the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n - 1)$) swelling tank" (hereinafter, the "second means for solving the problem").

Then, in [0004] summarized in the above (1), A, [0023] summarized in the above (1), E, etc., with respect to the action mechanism of the above problem to be solved by the invention, "defects in polarizing films caused by dirt," it is explained that bubbles generated in the swelling tank adhere to polyvinyl alcohol-based films that pass through the swelling tank, and, caused by the bubbles, such defects occur by adherence of dirt to the polyvinyl alcohol-based film. It is explained in [0007] summarized in the above (1), B, and [0021] summarized in the above (1), E, that the problem to be solved by the invention can be solved because generation of foam in the swelling tank can be effectively suppressed and adherence of bubbles to polyvinyl alcohol-based films can be decreased by the first means for solving the problem. [0009] summarized in the above (1), B, and [0024] summarized in the above (1), E explain that, by the second means for solving the problem, the plasticizer becomes difficult to elute from the polyvinyl alcohol-based film, and suppression of generation of foam can be carried out further reliably.

Furthermore, the description summarized in above (1), F indicates, as Examples 1 and 2, foaming height of multiple liquids with different TOC concentrations 5 minutes after 50 ml of sample is put into a 110 ml vial container and violently agitated in the vertical direction, as well as foaminess that is the volume (ml) of foam immediately after completion of 5-minute air blowing at the specified temperature (24°C) in multiple liquid samples with different TOC concentrations and foam stability that is measured as the volume (ml) of foam after being left as is for 10 minutes after measuring foaminess.

B With respect to the first means for solving the problem, it is a matter that a person skilled in the art can understand from common technical knowledge that, if the TOC concentration becomes smaller, the total volume of generated foam becomes smaller, and it has been confirmed by Example 1 disclosed in the Detailed Description of the Invention in the Specification. In addition, it is obvious that, if the total volume of generated foam becomes smaller, the total volume of foam adhering to the polyvinyl alcohol-based film also becomes smaller.

Then, it can be deemed that, from the description in the Detailed Description of the Invention of the Specification and common technical knowledge, a person skilled in the art can recognize that, by adopting the first means for solving the problem, at least,

the total volume of generated foam can be suppressed at a predetermines degree or less, and the total volume of foam adhered to a polyvinyl alcohol-based film can be suppressed.

However, since the experimental conditions in the above Examples 1 and 2 are completely different from various conditions relevant to generation of foaming in swelling treatment, it cannot be recognized from the descriptions with respect to Examples 1 and 2 in the Detailed Description of the Invention in the Specification that, in a method for manufacturing polarizing film in which the first means for solving the problem is adopted, generation of foam in swelling treatment can be made zero and adherence of foam to polyvinyl alcohol-based film can be completely prevented. In addition, even if it can be recognized that, by adopting the first means for solving the problem, the total volume of generated foam can be suppressed at a predetermined degree or less, even a person skilled in the art cannot recognize from the above description with respect to above Examples 1 and 2, how the mean volume of a single foam to be generated and its variation, the number of generated foam, etc. would be, how conditions of dirt adhered caused by the foam (the number of pieces of adhered dirt, mean area for each piece of dirt, etc.) would be, and how many the number of defects caused by the dirt would be.

Furthermore, the Detailed Description of the Invention in the Specification does not disclose any specific explanation with respect to the type of dirt the "dirt causing defects in polarizing films" that adheres to polyvinyl alcohol-based films caused by foam adhered to the polyvinyl alcohol-based films, and with what action mechanism such dirt adheres to polyvinyl alcohol-based films caused by foam adhered to the polyvinyl alcohol-based film, and with what action mechanism defects occur caused by the dirt, and it cannot be recognized that such matters were common technical knowledge as of the filing of the application. Then, since such matters cannot be understood, even a person skilled in the art cannot understand if the number of defects could be reduced only if the total volume of adhered foam is made small, or, it largely depends on a parameter different from the total volume of adhered foam, and whether the number of defects cannot necessarily be reduced even if the total volume of adhered foam is made small, etc. Accordingly, a person skilled in the art also cannot recognize based on the description in the Detailed Description of the Invention in the Specification other than descriptions with respect to Examples 1 and 2 and common technical knowledge that, if the first means for solving the problem is adopted, the problem to be solved by the invention can be solved.

According to the above, it should be deemed that a person skilled in the art cannot recognize from the description in the Detailed Description of the Invention in the Specification and common technical knowledge as of the filing of the application that, by adopting the first means for solving the problem, occurrence of defects in manufactured polarizing film can be suppressed.

C With respect to the second means for solving the problem, by the same reason as in the case of the first means for solving the problem, even if the description in the Detailed Description of the Invention in the Specification and common technical knowledge as of the filing of the application are taken into consideration, a person skilled in the art cannot recognize that, by adopting the second means for solving the problem, the problem to be solved by the invention can be solved.

In addition, right from the start, it is explained in the Detailed Description of the Invention in the Specification that, by the second means for solving the problem, in the swelling tank at the last stage in the carrying direction, it becomes difficult for plasticizer to elute from polyvinyl alcohol-based film, and generation of foam can be suppressed further reliably, but, even in the swelling tank at the last stage, its TOC concentration is "maintained at 1500 ppm or less," and the TOC concentration is not lower compared to other swelling tanks. Accordingly, it is obvious from technical point of view that, even if elution of plasticizer from the polyvinyl alcohol-based films becomes difficult in the swelling tank at the last stage by adopting the second means for solving the problem, generation of foam in the swelling tank at the last stage cannot be suppressed better than in other swelling tanks (It merely makes it possible to reduce supply of new liquid for making the TOC concentration 1500 ppm or less, or the time interval between supplies of new liquid can be made longer.)

Accordingly, from the above reason also, a person skilled in the art cannot recognize that, by adopting the second means for solving the problem, the problem to be solved by the invention can be solved.

D As described in above in B and C, even if the description in the Detailed Description of the Invention in the Specification and common technical knowledge as of the filing of the application are taken into consideration, a person skilled in the art cannot recognize that the problem to be solved by the invention can be solved by adopting the first means for solving the problem or the second means for solving the problem. Therefore, the invention is not within the scope which a person skilled in the art can recognize that the problem to be solved by the invention can be solved with the description in the Detailed Description of the Invention in the Specification, and it is not within the scope which, even without such description or suggestion, a person skilled in the art can recognize that the problem to be solved can be solved in the light of common technical knowledge as of the filing of the application.

(3) Appellant's allegation

In the written opinion submitted on September 25, 2018, Appellant asserts that the problem to be solved by the invention is "effectively suppress generation of foam in swelling tanks," and "can reduce occurrence of defects in polarizing films caused by dirt" is a mere secondary effect.

From the description in [0005] in the column for the problem to be solved by the invention (See above (1), A,) however, "effectively suppress generation of foam in swelling tanks" pointed out by Appellant is understood as a direct operation or function in the action mechanism to arrive at the solution of the problem to be solved by the invention, and it is reasonable to understand that the problem to be solved by the invention is just as described in the above (2), i, "to provide a method for manufacturing polarizing films that makes it possible to reduce occurrence of defects in polarizing film caused by dirt."

The above assertion by the Appellant cannot be accepted.

(4) Summary

As described above, the invention is not what is described in the Detailed Description of the Invention.

5 Judgment on reason 2 (Lack of inventive step)
(1) Cited Invention
A Cited document 1
(A) Description in Cited document 1

Cited document 1 (Japanese Unexamined Patent Application Publication No. 2007-51166) cited in reason 2 notified by the Body is a publication distributed before the priority date of the application (hereinafter, the "priority date"), and Cited document 1 has the following description (Underlined portions indicate portions having especially close relation with finding of Cited Invention to be mentioned below).

a [Technical field]

[0001]

The present invention relates to a swelling method for swelling polyvinyl alcohol film (hereinafter, "PVA film") as a base material through swelling water (pure water) as the first step in manufacturing polarizing film (polarizer) that is a primary member for liquid crystal displays (LCDs), a method for manufacturing polarizing film with PVA films swelled by the swelling method, and a polarizing plate manufactured by pasting a protective film on the manufactured polarizing film.

[Background Art]

[0002]

Major purposes of swelling of PVA film are, by causing swelling water to permeate PVA films, to elute plasticizer (used in the forming process of PVA film) in PVA films and remove it in swelling water, and bring PVA film into readily stainable condition; namely, condition of swelling suitable for dyeing (including dissociation and aligning of binding of hydrogen molecules), and, in the past, it has been carried out in a way to let swelling water to naturally permeate in a PVA film while carrying (guiding) the PVA film at a speed of, for example, 1.5 m/min in swelling water in swelling tanks through multiple guide rollers under a comparatively high tension (for example, 10 to 15 kg/m width) (See, for example, Patent document 1).

[0003]

However, a problem of uneven stainability that permeation of swelling water in the inside (middle part) tends to be insufficient (this seems to be influenced by distortion, deformation, etc. due to stretching by rather high tension such as 10 to 15 kg/m width), and, because of this, elution and removal of plasticizer from the inside is insufficient, resulting in that difference in dye performance between the surface part and the inside tends to occur, that is, a problem of uneven swelling that difference in swollen state in the thickness direction tends to occur has been identified in this conventional swelling method for PVA films. Because of this problem, from the point that uneven dyeing in the thickness direction that dyeing with dichroic material (iodine, dichroic dye, etc.) following the swelling process cannot be carried out evenly, for example, a higher concentration in the surface part but undyed portion or lower concentration in the middle part, it is rather difficult to manufacture polarizing film that has high polarizing performance necessary for obtaining polarizing plates that have uniform optical property required from recent improvement in characteristics of LCD (higher luminance, higher contrast, higher definition, etc.).

... (Omitted) ...

[Problem to be solved by the invention]

[0004]

Under this situation, the major problem to be solved by this invention is to provide a method for swelling PVA film that enables manufacture of polarizing film and a polarizing plate provided with high polarizing property by which permeation of swelling water to the inside of the PVA film and elution and removal of plasticizer inside the PVA film are carried out in nearly perfect manner, and the swollen state in the thickness direction becomes nearly uniform, with the result that dyeing following the swelling process can be carried out more uniformly in the thickness direction.

[Means for solving the problem]

[0005]

According to the invention, first, as disclosed in claim 1, there is provided a PVA film swelling method characterized in that in the process of carrying a PVA film in swelling water in swelling tanks through multiple guide rollers, the PVA film, together with swelling water, is subjected to ultrasonic vibration.

... (Omitted) ...

[0011]

Furthermore, according to the invention, as disclosed in claim 7, there is provided a method for manufacturing polarizing films in which PVA films are stretched after dyeing PVA films swollen through the swelling method disclosed in any of claims 1 to 3 with dichroic material.

... (Omitted) ...

[Advantage of the Invention]

[0014]

According to the method and apparatus for swelling PVA film of the inventions disclosed in claims 1, 2, and 4, since PVA film is subjected, together with swelling water, to ultrasonic vibration during carriage in swelling water in the swelling tank, permeation of swelling water into the PVA film is promoted, and, by this, removal by elution of plasticizer in the PVA film is promoted, and swelling with a local minimum difference in the direction of thickness is carried out quickly. As a result of such swelling that is almost uniform, in the next step, dyeing, dyeing with dichroic material is carried out more uniformly and, because of this, polarizing film that has more excellent polarizing property, and, accordingly, a polarizing plate that has a more excellent polarizing property can be obtained.

... (Omitted) ...

[0017]

Furthermore, according to the method for manufacturing polarizing film disclosed in claims 7 and 8, since swelled state of used PVA film is uniform, dyeing with dichroic material is carried out uniformly, and polarizing film with better polarizing property can be manufactured."

b [Best Mode for Carrying Out the Invention]

[0019]

A preferred embodiment of the swelling method for PVA films according to the invention is explained based on drawings.

[0020]

In the illustrated embodiment, a swelling tank 11 is separated into a fore tank 12 on the PVA film 10 introducing side and an aft tank 13 of the PVA film 10 on the lead-

out side through a partition 15, provided with a film passage window 16, which stands in the middle portion in the front-back direction. In swelling water 14 in the foreside of the fore tank 12, a guide roller 18 is installed for guiding the PVA film 10 introduced from the upper film introducing roller 17 to turn backward on one hand, and, in swelling water 14 in the rear section of the aft tank 13, a guide roller 19 is installed for guiding the PVA film 10 carried from the fore tank 12 to the aft tank 13 through the film passage window 16 of the partition 15 to turn toward the upper film lead-out roller 20 on the other hand.

[0021]

In addition, in swelling water 14 in the middle part in the front-back direction of the fore tank 12 of the swelling tank 11, a pair of upper and lower throw-in type ultrasonic vibrators 21 and 22 are installed above and below the PVA film 10 carried toward the aft tank 13 as a means for generating ultrasonic vibration.

[0022]

Furthermore, for forming a forward flow of swelling water along the PVA film 10, a pair of upper and lower water supply pipes 23 and 24 having many discharge outlets (not illustrated) opening toward the ultrasonic vibrators 21 and 22 are arranged between those ultrasonic vibrators 21 and 22 and the partition 15.

[0023]

In the illustrated embodiment, through a film introducing roller 17, each part of PVA film 10 introduced in the swelling water 14 in the swelling tank 11 under low tension (for example, 1.0 to 1.5 kg/m width) is subjected to, in the middle of the fore tank 12 in the front-back direction, together with the swelling water 14, ultrasonic vibration (frequency is, for example, 28 KHz, or 40 KHz) by the ultrasonic vibrators 21 and 22 in sequence, and, by this, permeation of the swelling water 14 into the inside and elution of plasticizer inside the film in the swelling water 14 are promoted and swelling that is nearly uniform and perfect is carried out quickly.

[0024]

Plasticizer eluted in the swelling water 14 is flown forward by flow of swelling water along the PVA film 10 based on swelling water (see arrow) discharged from the water discharge outlets of the water supply pipes 23 to 24, ahead of the ultrasonically vibrated part of the PVA film 10, and, since the concentration of plasticizer in the swelling water 14 in the neighborhood of the ultrasonically vibrated part becomes low, elution of plasticizer is carried out more effectively.

[0025]

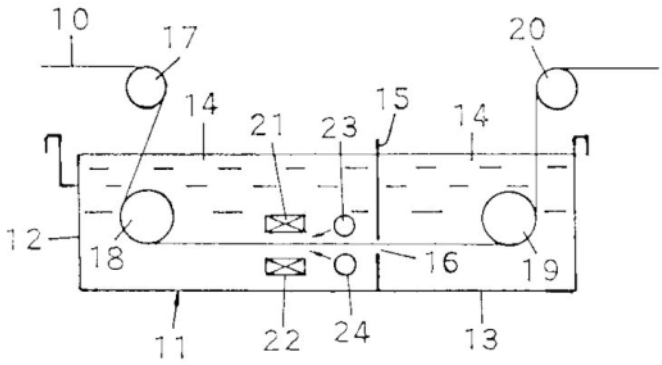
As described above, the PVA film 10 whose swollen state is quickly changed toward uniform and perfect state through promoted permeation of the swelling water 14 and elution of plasticizer by ultrasonic vibration of the swelling water 14 and the PVA film 10 enters the aft tank 13 through the film passage window 16 of the partition 15, and is subjected to swelling action by natural permeation of the swelling water 14 while it is guided and carried backward in the swelling water 14 and upward through the guide roller 18 (Note by the Body: "guide roller 18" is a typographical error, and it should be understood as "guide roller 19"). However, since a considerable amount of plasticizer has already been eluted and removed in the fore tank 12, and the degree of contamination (concentration of eluted plasticizer) of the swelling water 14 in the aft tank 13 is low, swelling progresses in the form of finishing toward a uniform and perfect state, and the PVA film 10 is lead out of the swelling tank 11 in such good

swollen state through the film lead-out roller 20.
[0026]

Thereafter, after introducing the PVA film 10 into a dyeing tank that contains dichroic material and subjecting the same to dyeing and finishing processes, the PVA film 10 is introduced into the stretching tank and subjected to stretching treatment, and a polarizing film is manufactured by further conducting fixing treatment, drying treatment, etc.
[0027]

Other than that, the invention may be worked in various embodiments such that a water supply pipe for forming flow of swelling water along the PVA film in the fore tank is installed in the neighborhood of the film passage window of the partition in swelling water in the aft tank, or, for maintaining the degree of contamination of swelling water in the aft tank low, a means for supplying fresh swelling water is attached to the aft tank."

c "[Brief description of drawings]
[0030]
[FIG. 1] A configuration overview of an embodiment of the PVA film swelling method of the invention.
... (Omitted) ...
[FIG. 1]



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(B) Invention disclosed in Cited document 1

From the description in Cited document 1 as a whole including those summarized in above (A), a to c, the invention of a method for manufacturing polarizing films in which swelling is carried out using a swelling tank 11 in which a means to supply fresh swelling water is attached to the aft tank 13 can be grasped, and the constitution of the invention is as shown below (for convenience of explanation, the process for swelling PVA film 10 is referred to as "swelling process," the process to dye swelled PVA film 10 as "dyeing process," and the process for stretching dyed PVA film 10 as "stretching process").

"A method for manufacturing polarizing films comprising a swelling process for swelling a PVA film 10 as a base material in a swelling tank 11 through pure water that is swelling water 14, a dyeing process for dyeing the swelled PVA film 10 with a

dichroic material, and a stretching process for stretching the dyed PVA film 10, configured so that:

the swelling tank 11 is separated into a fore tank 12 on the PVA film 10 introducing side and an aft tank 13 on the PVA film 10 leading-out side by a partition 15 provided with a film passage window 16 standing in the middle part in the front-back direction,

a guide roller 18 is installed in the swelling water 14 in the front part of the fore tank 12 for guiding the PVA film 10 introduced from the upper film introducing roller 17 to turn to backward, and a pair of upper and lower throw-in type ultrasonic vibrators 21 and 22 are installed in the middle part in the front-back direction in the swelling water 14 above and below the PVA film 10 carried toward the aft tank 13, and a pair of upper and lower water supply pipes 23 and 24 having many discharge outlets opening toward the ultrasonic vibrators 21 and 22 are installed between those ultrasonic vibrators 21 and 22 and the partition 15 for forming a forward flow of swelling water along the PVA film 10,

a guide roller 19 for guiding the PVA film 10 carried from the fore tank 12 to the aft tank 13 through the film passage window 16 of the partition 15 to turn toward the upper film lead-out roller 20 is installed in the swelling water 14 in the back part of the aft tank 13, and a means for supplying fresh swelling water is also attached,

the major purpose of the swelling process is to elute and remove plasticizer contained in the PVA film in swelling water and to bring the PVA film into readily stainable condition; namely, into a swollen state suitable for dyeing,

in the swelling process, the PVA film 10 is introduced under a low tension of 1.0 to 1.5 kg/m width in the swelling water 14 in the swelling tank 11 through the film introducing roller 17,

in the middle part of the fore tank 12 in the front-back direction, the PVA film 10 together with the swelling water 14 is subjected to ultrasonic vibration of 28 KHz or 40 KHz by the ultrasonic vibrators 21 and 22 in sequence, and it is arranged by this so that permeation of the swelling water 14 into the inside and elution of plasticizer existing inside in the swelling water 14 are promoted and swelling that is nearly uniform and perfect is carried out quickly, and, at the same time, by discharging a forward flow of swelling water along the PVA film 10 from the water discharge outlets of the water supply pipes 23 and 24, plasticizer eluted in the swelling water 14 is flown forward ahead of the ultrasonically vibrated part of the PVA film 10 by the flow of swelling water and the concentration of plasticizer in the swelling water 14 in the neighborhood of the ultrasonically vibrated part is made low so that plasticizer can be eluted more effectively, and, if the PVA film 10 enters the aft tank 13 through the film passage window 16 of the partition 15, the PVA film 10 is subjected to swelling action by natural permeation of the swelling water 14 for which the degree of contamination is maintained low while the PVA film 10 is carried backward in the swelling water 14 in the aft tank 13 in which the degree of contamination is maintained low by the means for supplying fresh swelling water backward and upward through the guide roller 19, swelling progresses in the form of finishing toward a uniform and perfect state, and the PVA film 10 is lead out of the swelling tank 11 in a good swollen state through the film lead-out roller 20" (hereinafter, "Cited Invention").

B Cited document 2

(A) Description in Cited document 2

Cited document 2 (Japanese Unexamined Patent Application Publication No. 2014-197050) cited in reason 2 notified by the body is a publication distributed before the priority date of the application, and Cited document 2 has the following description (Underlined portions indicate portions with especially close relation with finding of the art of Cited document 2).

a "[Technical field]

[0001]

The invention relates to a method for manufacturing polarizing film for use in a liquid crystal display device.

Background Art

... (Omitted) ...

[0003]

A polarizing film is manufactured by subjecting a polyvinyl alcohol-based resin film to swelling treatment, dyeing treatment, stretching treatment, boric-acid treatment (cross-linking treatment), and washing treatment, and drying at the end. The stretching treatment is normally carried out using a pair of nip rolls by changing the rotational peripheral speed of the nip rolls.

[0004]

In recent years, there is a trend in the market to require, in addition to enlargement and thinning of liquid crystal display devices, high display quality, and, along with this, manufacturing methods that can realize higher performances such as broadening and thinning of polarizing films, such as excellent optical character, and in-plane uniformity throughout the whole area of large-sized polarizing film are sought. For manufacturing large-sized polarizing films, it is necessary to uniformly and uniaxially extend wide raw films... (Omitted) ...

[0005]

For example, Japanese Patent No. 4229932 (Patent document 1) discloses a method for manufacturing polarizing films with which high quality polarizing films with suppressed color unevenness can be manufactured in a short period by providing multiple swelling treatment tanks and setting the tank temperature in a swelling treatment tank placed on the earlier stage higher than the tank temperature of swelling treatment tank placed on the later state. With this manufacturing method, since the amount of expansion of the resin film reaches saturation in a short period of time, the film becomes hard to swell in the following dyeing treatment, and color unevenness in polarizing films caused by swelling of the film in the dyeing treatment is suppressed. On the other hand, if only the bathing temperature in the swelling treatment tank that comes earlier is made high as in Patent document 1, there are problems that the film is abruptly swelled by the high treatment temperature, resulting in uneven film thickness, and that, depending on the temperature of the following swelling treatment tank, the film is further swelled, resulting in occurrence of wrinkle in the film, leading to deteriorated appearance.

... (Omitted) ...

[Problem to be solved by the invention]

[0007]

The problem to be solved by the invention is to provide a method for manufacturing polarizing film with excellent appearance, which method provides

excellent productivity and suppressing uneven film thickness and generation of wrinkle in each treatment, in particular, in swelling treatment of raw films comprising polyvinyl alcohol-based resin.

[Means for solving the problem]
[0008]

As a result of diligent study, the inventor found that, in manufacturing polarizing films by subjecting raw films comprising polyvinyl alcohol-based resin to swelling treatment, dyeing treatment, boric-acid treatment, and wash treatment in this order, if the thickness of a raw film is 10 to 60 μm and such raw film is subjected to swelling treatment to pass the raw film through multiple swelling treatment tanks, even if raw film is thin, uneven swelling of film and resulting generation of wrinkle can be suppressed and films with excellent appearance can be efficiently obtained, if the expansion coefficient of film in the width direction in the first swelling treatment tank which the raw film passes at first is within a predetermine range, and the treatment temperature and the time period for passing through the first and second swelling treatment tanks are adjusted so that the difference between this expansion coefficient and the expansion coefficient of the film in the width direction in the second swelling treatment tank becomes within a predetermined range, ... (Omitted) ... The invention was completed based on such knowledge.
[0009]

Namely, according to the invention, there is provided a method for manufacturing polarizing film by subjecting raw film comprising polyvinyl alcohol-based resin to swelling treatment, dyeing treatment, boric-acid treatment, and wash treatment in this order, in which method, the thickness of raw film is 10 to 60 μm, and above swelling treatment is carried out by passing raw film through multiple swelling treatment tanks including at least a first swelling treatment tank and a second swelling treatment tank in this order from the side of entrance of raw film, and the treatment temperature in and the time period for passing through the first and second swelling treatment tanks are adjusted so that the expansion coefficient of the film in the first swelling treatment tank in the width direction is 90% or less of the saturated expansion coefficient when dipped in a treatment liquid of the same temperature, and the difference between the expansion coefficient of the film in the width direction in the first swelling treatment tank and the expansion coefficient of the film in the width direction in the second swelling treatment tank respectively expressed in percentage is within 2 points in absolute value.
[0010]

In this method, the treatment temperature of the first swelling treatment tank is 35 to 45°C, and the treatment temperature of the second swelling treatment tank is preferably lower than the treatment temperature of the first swelling treatment tank, and 25 to 35°C. ... (Omitted) ...
[Advantage of the Invention]
[0013]

According to the method for manufacturing polarizing films of the invention, in various treatments carried out in manufacturing polarizing films, especially in swelling treatment, since uneven swelling of the film can be suppressed and occurrence of wrinkles and breakage of the film caused by uneven swelling can be suppressed,

polarizing film with excellent appearance can be efficiently obtained."

b "[Description of Embodiments]
[0014]
In the invention, polarizing film is manufactured by subjecting raw films comprising polyvinyl alcohol-based resin to swelling treatment, dyeing treatment, boric-acid treatment, and wash treatment in this order. Then, in polarizing film obtained by carrying out drying treatment after wash treatment, wrinkles, etc. are suppressed, and the film can be used preferably for polarizing plates. The invention is described in detail below.
[0015]
[A method for manufacturing polarizing film]
... (Omitted) ...
[0018]
(Swelling treatment)
The swelling treatment is carried out for the purposes of removing foreign materials on the surface of raw film comprising polyvinyl alcohol-based resin, removing plasticizer in the film, giving readily stainable property for following dyeing treatment, plasticization of films, etc. Treatment conditions are decided within the range in which such purposes can be achieved, and no defect such as extreme dissolution of polyvinyl alcohol-based resin film or loss of transparency occurs. When subjecting a raw film to swelling treatment for the first time, for example, it is carried out by dipping the film in a treatment tank with a temperature of about 20 to 50°C, preferably 25 to 45°C. Dipping time is, for example, about 30 to 300 seconds, preferably 40 to 200 seconds.
... (Omitted) ...
[0023]
As one of embodiments of the invention, an embodiment in which swelling treatment is carried out through multiple processes can be pointed out. In this case, swelling treatment is carried out by passing raw film through multiple swelling tanks including at least a first swelling treatment tank and a second swelling treatment tank in this order from the side of entrance of raw film. The treatment temperature in and the period of time for passing the film through the first and second swelling treatment tanks are appropriately adjusted so that the expansion coefficient of the film in the width direction is within a predetermined range.
[0024]
The above-mentioned expansion coefficient of a film in the width direction is explained below. The expansion coefficient of a film in the width direction is expansion of the film in the width direction caused by swelling treatment, expressed as a percentage. ... (Omitted) ...
[0025]
Accordingly, the expansion coefficient in the first swelling treatment tank in the invention means the expansion coefficient obtained when the above fragment of film is subjected to swelling treatment under the treatment condition as used in the first swelling treatment tank ... (Omitted) ...
[0026]
Similarly, the expansion coefficient in the second swelling treatment tank in the

invention means the expansion coefficient obtained when the above fragment of film subjected to swelling treatment under the treatment condition as used in the first swelling treatment tank is further subjected to swelling treatment under the treatment condition as used in the second swelling treatment tank. ... (Omitted) ...

[0027]

In addition, saturated expansion coefficient in the invention means the expansion coefficient obtained by cutting out a fragment of film, 50 mm in the length direction x 50 mm in the width direction, from raw film separately from those used for calculating the expansion coefficient in the above swelling treatment tanks, and dipping the fragment in a treatment tank for 10 minutes ... (Omitted) ...

[0028]

In the invention, in an embodiment in which swelling treatment is carried out in multiple processes, the period of time for passing through the treatment tank is adjusted so that the expansion coefficient of polyvinyl alcohol-based resin film in the width direction in the first swelling treatment tank is 90% or less of the saturated expansion coefficient when the film is dipped in a treatment liquid of the same temperature. By setting it to 90% or less of the saturated expansion coefficient, even when forwarding speed of the film is made fast, there is no need to use any huge manufacturing equipment, and swelling treatment can be carried out efficiently. In addition, the expansion coefficient of the film in width direction in the first swelling treatment tank is preferably 70% or more. If it is smaller than 70%, it is difficult to evenly swell film surface in swelling treatment, and uneven coloring and wrinkle tend to occur.

[0029]

In addition, if the above expansion coefficient in the first swelling treatment tank is too small, and the expansion coefficient in the second swelling treatment tank is large, since the film swells abruptly in the second swelling treatment tank, bias in the expansion coefficient occurs between the edge part and the middle part of the film. As a result, when passing through the above stretching equipment inside the treatment tank, this bias in the expansion coefficient might cause wrinkles. On the other hand, if the expansion coefficient in the first swelling treatment tank is too large, stretching equipment, through which the film passes inside the treatment tank, cannot sufficiently stretch the film resulting in wrinkles in some cases. Accordingly, it is important to adjust the period of time for passing through the first and second swelling treatment tanks so that the difference between the expansion coefficient of the film in the width direction in the first swelling treatment tank and the expansion coefficient of the film in the width direction in the second swelling treatment tank respectively expressed in percentage is within 2 points in absolute value.

[0030]

As described above, by adjusting the treatment temperature in and the period of time for passing through the first and second swelling treatment tanks so that the difference between the expansion coefficient of the film in the width direction in the first swelling treatment tank and the expansion coefficient of the film in the width direction in the second swelling treatment tank respectively expressed in percentage is within 2 points in absolute value, insufficient treatment in the first swelling treatment tank is suppressed, and undesirous abrupt swelling in the second swelling treatment tank can be suppressed. In addition, since uneven thickness of the film when swelled can be suppressed by combining the treatment temperature in and the period of time for

passing through the first and second swelling treatment tanks, generation of wrinkles caused by uneven thickness of the film is suppressed and polarizing film with excellent optical property and appearance can be manufactured.
[0031]

In the case in which swelling treatment is carried out by passing through multiple swelling treatment tanks, for the purpose of shortening the time for swelling treatment, it is preferred that the treatment temperature of the first swelling treatment tank is higher than the treatment temperature of the second swelling treatment tank, and is preferably 35 to 45°C. In addition, the temperature of the second swelling treatment tank is preferably 25 to 35°C. In addition, it is preferred that the treatment temperature in and the period of time for passing through the first swelling treatment tank are adjusted so that the expansion coefficient of the film in the width direction in the first swelling treatment tank is 15 to 25%.
[0032]

The time for the film to pass through the first swelling treatment tank is 10 to 60 seconds, preferably 15 to 50 seconds. The time for the film to pass through the second swelling treatment tank is also 10 to 60 seconds, preferably 15 to 50 seconds."

c "[0067]
[Example 1]

A 60 μm thick long polyvinyl alcohol film [Kuraray-made, commercial name 'Kuraray POVAL film VF-PE #6000,' polymerization degree 2400, saponification degree 99.9 mol% or more] was prepared, and, as swelling treatment, after dipping the film in the first swelling treatment tank containing pure water of 37°C for 40 seconds while keeping the film in a state of tension without loosening, the film was dipped in the second swelling treatment tank containing pure water of 30°C for 20 seconds. On this occasion, the film was carried in the first swelling treatment tank through expander rolls. Next, as dyeing treatment, the film was uniaxially extended to 2.2 times in the dyeing treatment tank containing a 30°C aqueous solution of iodine and potassium iodide for 60 seconds, and, while carrying out the water resistance treatment by dipping in the cross-linking treatment tank containing a 55°C aqueous solution comprising 12/4.4/100 by weight of potassium iodide/boric acid/water, uniaxial extension was carried out until the integrated draw ratio from the raw film reached 5.5 times. Then, after dipping in the complementary color treatment tank containing a 40°C aqueous solution of boric acid, the film was dipped in the wash treatment tank containing 12°C pure water, and, after that, dried with a drying furnace at 70°C for 3 minutes. A polarizing film was manufactured in this way. Neither wrinkle nor breakage of the film was observed in swelling treatment.
... (Omitted) ...
[0079]
[Comparative Example 1]

A polarizing film was prepared in a similar manner to Example 1, except that the dipping time in the first swelling treatment tank was changed to 10 seconds. In the first swelling treatment tank and the second swelling treatment tank, wrinkles were generated, and breakage of the film occurred frequently while extending. Wrinkles were detected in appearance check of the obtained polarizing film.
... (Omitted) ...

[0099]
[Table 1]

例No.	原反フィルム	膨潤処理				染色処理		膨張率1	膨張率2	膨張率差	膨張率1/飽和膨張率
		第一の膨潤処理槽		第二の膨潤処理槽		染色処理槽					
	(μm)	温度(℃)	時間(秒)	温度(℃)	時間(秒)	温度(℃)	時間(秒)	(%)	(%)	(ポイント)	(%)
実施例1	60	37	40	30	20	30	60	22.0	21.2	−0.8	86.6
実施例2	50	35	30	30	20	30	60	20.9	21.0	0.1	86.4
実施例3	60	37	40	—	—	30	60	22.0	21.7	−0.3	86.6
比較例1	60	37	10	30	20	30	60	10.7	16.4	5.7	42.1
比較例2	50	35	10	30	20	30	60	13.2	18.1	4.9	54.5
比較例3	50	35	100	30	20	30	60	23.4	23.5	0.1	96.7
比較例4	50	50	30	30	20	30	60	38.6	34.0	−4.6	83.5
比較例5	50	20	30	30	20	30	60	8.9	16.1	7.2	48.6

例 No.　Example No.
実施例　Example
比較例　Comparative example
原反フィルム　Raw film
膨潤処理　Swelling treatment
第一の膨潤処理層　First swelling treatment tank
第二の膨潤処理槽　Second swelling treatment tank
温度（℃）　Temperature (°C)
時間（秒）　Time (sec)
染色処理　Dyeing treatment
染色処理槽　Dyeing treatment tank
膨張率　expansion coefficient
膨張率差　Difference in expansion coefficient (point)
膨張率１／飽和膨張率　Expansion coefficient 1/saturated expansion coefficient

[0100]
From Table 1, comparing Example 1 that satisfies all definitions by the invention and Comparative Example 1 that uses the same raw film as Example 1 but does not satisfy the definition by the invention, while no wrinkle was detected in the obtained polarizing film and appearance was excellent in Example 1 as a result of sufficient swelling in the first swelling treatment tank, and no wrinkle caused by the difference in the expansion coefficient in the following second swelling treatment tank was found, as a result of insufficient swelling because of short treatment time in Comparative Example 1, wrinkles and breakages of the film occurred during manufacturing, and wrinkles were identified in obtained polarizing film."

(B) Technical matters described in Cited document 2
From whole descriptions of Cited document 2 summarized in above (A), a to c, it is acknowledged that the following technical matters are described in Cited document 2.

"In a method for manufacturing a polarizing film, a polarizing film that has excellent appearance can be efficiently obtained since uneven swelling can be suppressed, and generation of wrinkles and occurrence of breakage of the film caused by uneven swelling can be suppressed, by:

using a 10 to 60 μm thick film of polyvinyl alcohol-based resin as a raw film,

subjecting the raw film to swelling treatment by passing the film through a first swelling treatment tank and a second swelling treatment tank in sequence from the side of entrance of the raw film,

adjusting the treatment temperature in and the period of time for passing through the first and second swelling treatment tanks so that the expansion coefficient of the film in the first swelling treatment tank in the width direction is 70% or more but 90% or less of the saturated expansion coefficient when dipped in a treatment liquid of the same temperature, and 15 to 25%, and the difference between the expansion coefficient of the film in the width direction in the first swelling treatment tank and the expansion coefficient of the film in the width direction in the second swelling treatment tank respectively expressed in percentage is within 2 points in absolute value,

setting the treatment temperature of the first swelling treatment tank to 35 to 45°C, and

setting the treatment temperature of the second swelling treatment tank lower than the treatment temperature of the first swelling treatment tank, to 25 to 35°C," (hereinafter, the "art of Cited document 2").

(2) Comparison

A Judging from operation, function, etc., "PVA film 10," "swelling," "dyeing," "polarizing film," "method for manufacturing polarizing films," and "swelling tank 11" in Cited Invention respectively correspond to "a polyvinyl alcohol-based film," "swelling treatment," "dyeing treatment," "a polarizing film," "a method for manufacturing polarizing films," and "swelling tank" in the invention.

B Since the dyeing process is carried out after the swelling process in Cited Invention, "swelling" carried out in the swelling process (corresponds to "swelling treatment" in the invention; hereinafter, in the section, "(2) Comparison," terms in brackets added to configurations of Cited Invention express matter specifying the invention of the invention that corresponds to configuration of Cited Invention) and "dyeing" (dyeing treatment) carried out in the dyeing process are carried out in this order.

Accordingly, Cited Invention coincides with the invention in that they relate to "a method for manufacturing polarizing films by subjecting polyvinyl alcohol-based films to swelling treatment and dyeing treatment in sequence."

C In Cited Invention, since "swelling" (swelling treatment) carried out in the swelling process is carried out in the "swelling tank 11" during the time period from the introduction of the "PVA film 10" in swelling water 14 in the swelling tank 11 through the film introducing roller 17 to leading out of the "PVA film 10" to the outside of the swelling tank 11 through the film lead-out roller 20, it can be deemed that "swelling" is carried out by passing the "PVA film 10" (a polyvinyl alcohol-based film) through the "swelling tank 11" (swelling tank).

Accordingly, "swelling" in Cited Invention and "swelling treatment" in the invention have a common point that they are "carried out by passing polyvinyl alcohol-based films through swelling tanks."

D In the light of above A to C, the invention and the Cited Invention coincide with

each other in that they relate to:
"a method for manufacturing polarizing films by subjecting polyvinyl alcohol-based films to swelling treatment and dyeing treatment in sequence, wherein
the swelling treatment is carried out by passing polyvinyl alcohol-based films through swelling tanks" and differ in terms of the following points.

Different feature 1:

While, in the "swelling treatment" of the invention, "polyvinyl alcohol-based films" are passed through n (n is a natural number not smaller than 2) "swelling tanks" in sequence, and the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n-1)$) swelling tank,

in "swelling" in Cited Invention, the "PVA film 10" is passed through the fore tank 12 and the aft tank 13, but the fore tank 12 and the aft tank 13 are two segments in the swelling tank 11 separated with the partition 15, and they cannot be deemed as two swelling tanks, and the magnitude relationship between the temperature in the fore tank 12 and the temperature in the aft tank 13 is not specified.

Different feature 2:

While swelling treatment is carried out in the invention maintaining the TOC concentration in the swelling tanks at 1500 ppm or less,

the TOC concentration in the fore tank 12 and the aft tank 13 is not specified in Cited Invention.

(3) Different feature 1 is easily conceivable

It is a matter that a person skilled in the art could have easily carried out to apply the art disclosed in Cited document 2 identified in above (1), B, (B) to the Cited Invention for the purpose of efficiently obtaining polarizing films that have excellent appearance by suppressing uneven swelling and suppressing wrinkles and breakage of films caused by uneven swelling; in other words, instead of the means to use a 10 to 60 μm thick PVA film 10 as a base material and, in the swelling process, to pass the PVA film 10 through the fore tank 12 and the aft tank 13 of the swelling tank 11, to adopt a means in which the PVA film 10 is passed through the first swelling treatment tank and the second swelling treatment tank in this order from the side of entrance of the film, and to provide the first swelling treatment tank with the ultrasonic vibrators 21 and 22 as well as the water supply pipes 23 and 24 arranged in the fore tank 12, and to provide the second swelling treatment tank with a means to supply fresh swelling water that is attached to the aft tank 12, and, in addition, to adjust the treatment temperature in and the time period for passing through the first and second swelling treatment tanks and further set the treatment temperature in the first swelling treatment tank to the range of 35 to 45°C and the treatment temperature in the second swelling treatment tank lower than the treatment temperature in the first swelling tank to the range of 25 to 35°C so that the expansion coefficient of the film in the first swelling treatment tank in the width direction is 70 to 90% of the saturated expansion coefficient when dipped in a treatment liquid of the same temperature and is 15 to 25%, and the difference between the expansion coefficient of the film in the width direction in the first swelling treatment tank and the expansion coefficient of the film in the width direction in the second

swelling treatment tank respectively expressed in percentage is within 2 points in absolute value.

However, the Cited Document after such modification of configuration is provided with the configuration that corresponds to the matter specifying the invention of the invention according to Different feature 1,
"a polyvinyl alcohol-based film is passed n (n is a natural number not smaller than 2) swelling tanks in sequence, the temperature of the n-th swelling tank in the carrying direction of the polyvinyl alcohol-based film is not higher than the temperature of the k-th ($1 \leq k \leq (n-1)$) swelling tank."

Accordingly, a person skilled in the art could have easily conceived based on the art disclosed in Cited Document 2 to make the Cited Document provided with a configuration that corresponds to the matter specifying the invention of the invention according to Different feature 1.

(4) Different feature 2 is easily conceivable

A The purpose of installing the water supply pipes 23 and 24 in the "fore tank 12" and discharging the flow of swelling water forward along the PVA film 10 from the water discharge outlets of the water supply pipes 23 and 24 in the Cited Document is to flow plasticizer eluted in swelling water 14 ahead of the ultrasonically vibrated part of the PVA film 10 with the flow of swelling water for making the concentration of plasticizer in swelling water 14 in the neighborhood of the ultrasonically vibrated part low to effectively carry out elution of the plasticizer. Accordingly, it is obvious to a person skilled in the art that fresh swelling water is discharged from the water supply pipes 23 and 24.

However, a person skilled in the art could have easily predicted that there is a risk that the concentration of plasticizer in swelling water 14 in the neighborhood of the ultrasonically vibrated part cannot be kept low, if the concentration of plasticizer in swelling water 14 in the "fore tank 12" becomes too high, even if the flow of swelling water is discharged from the water supply pipes 23 and 24, while the flow of swelling water flows forward along the PVA film 10 from the water discharge outlets of the water supply pipes 23 and 24, it is mixed with swelling water 14 with high concentration of plasticizer.

Then, in Cited Invention, a person skilled in the art could have appropriately carried out to provide certain means to control the concentration of plasticizer so that the concentration of plasticizer in swelling water 14 in the "fore tank 12" does not exceed the predetermined value; for example, by experimentally obtaining the quantity of swelling water with which the concentration of plasticizer in swelling water 14 in the "fore tank 12" does not exceed the predetermined value and setting the supply quantity of discharged fresh swelling water 14 from the water supply pipes 23 and 24 to a value that is not less than such supply quantity, or installing a "means for supplying fresh swelling water" attached to the "aft tank 13" also in the "fore tank 12" and, with the "means for supplying fresh swelling water" supplying fresh swelling water in a quantity with which the concentration of plasticizer in swelling water 14 in the fore tank 12 does not exceed the predetermined value.

B In addition, in Cited Invention, since the swelling process is a process for eluting and removing plasticizer in PVA films in swelling water and, in addition, for making

the PVA films ready for dyeing; namely, bringing into a swelled state suitable for dyeing, if the concentration of plasticizer in swelling water 14 in the fore tank 12 or the concentration of plasticizer in swelling water in the aft tank 13 changes, the dyed state of manufactured polarizing films also changes and the quality is also changed.

Accordingly, it is obvious to a person skilled in the art that it is preferred, in order to stably manufacture high quality polarizing films in Cited Invention, throughout the manufacturing period, that, to the extent possible, the concentration of plasticizer in swelling water 14 in the swelling tank is close to "zero" that is the concentration of plasticizer in swelling water 14 (pure water) in the swelling tank immediately after the start of manufacture.

On the other hand, it is also obvious to a person skilled in the art that, throughout the manufacturing period, the closer to "zero" the concentration of plasticizer in swelling water 14 in the swelling tank to be maintained, the higher the cost.

Then, to what value the upper limit value for the concentration of plasticizer in swelling water 14 in the "fore tank 12" that has a configuration modified as described in above A, and the upper limit value for the concentration of plasticizer in swelling water 14 in the "aft tank 13" should be set should be deemed as design choice that may be appropriately determined by a person skilled in the art comprehensively taking into consideration quality and stability of manufactured polarizing films and required cost, etc.

In addition, it is also a design choice that a person skilled in the art may appropriately determine with what parameters the concentration of plasticizer in swelling water 14 should be evaluated.

C In the light of above A and B, a person skilled in the art could have appropriately carried out in Cited Invention the swelling process maintaining the TOC concentration in the fore tank 12 and aft tank 13 in the swelling tank 11 (in Cited Invention in which modification of configuration described in above (3) has been carried out, "the first swelling treatment tank" and "the second swelling treatment tank") at 1500 ppm or less; namely, to make Cited Invention provided with a configuration that corresponds to the matter specifying the invention of the invention according to Different feature 2.

(5) Regarding the effect

The effects of the invention are such that a person skilled in the art could have predicted based on descriptions in Cited documents 1 and 2 and common technical knowledge.

(6) Summary

As explained in (2) to (5) above, a person skilled in the art could have easily invented the invention based on Cited Invention and the art of Cited document 2, whereby the invention is not patentable under the provision of Article 29(2) of the Patent Act.

6 Closing

The description in the Claim in the application does not comply with the requirement set forth in Article 36(6)(i) of the Patent Act.

In addition, since the invention is such that a person skilled in the art could have

easily invented based on Cited Invention and the art of Cited document 2 even without examining any invention according to any other claim, the application is not patentable under the provision of Article 29(2) of the Patent Act.

Therefore, the appeal decision shall be made as described in the conclusion.

November 5, 2018

Chief administrative judge: NAKADA, Makoto
Administrative judge: SHIMIZU, Yasushi
Administrative judge: KAWAHARA, Tadashi