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(54) GRAVURE PRESS FOR MANUFACTURING FIRE-RETARDANT BANDED CIGARETTE PAPER AND MANUFACTURING METHOD FOR SAME

(57) Disclosed are a gravure printing machine and method for producing cigarette paper (11) having fire-retardant bands (2). The gravure printing machine comprises a fire-retardant printing device consisting of a printing machine roller (3) and a rubber engaging roller (10); the fire-retardant bands are printed on the cigarette paper by means of the fire-retardant printing device. The gravure printing machine also comprises a drying device and a pressing device. The drying device comprises a drying cylinder (12) located downstream of the printing machine roller and the rubber engaging roller. The cigarette paper comes into tight contact with the drying cylinder after passing through a contact point between the printing machine roller and the rubber engaging roller. The pressing device comprises an upper press roller (14) and a lower press roller (15) arranged in parallel to and in contact with the upper press roller. The cigarette paper passes through the contact point between the upper press roller and the lower press roller. In the gravure printing machine, the paper is first printed, then dried, and then pressed; thereby reducing the likelihood of paper deformation and wrinkling, as well as the coating thickness of the fire-retardant bands.

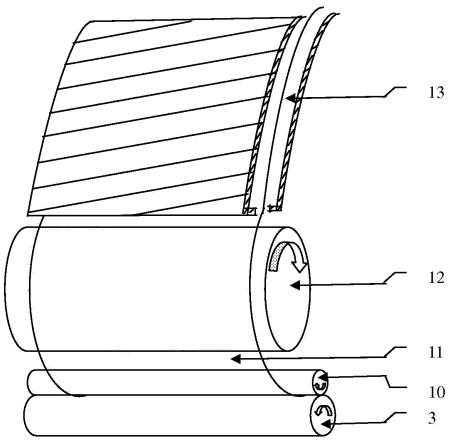


Fig.3

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Description

TECHNICAL FIELD

[0001] The present invention relates to a printing apparatus and producing method for cigarette paper, and more particularly to a gravure printing machine and method for producing a cigarette paper having fire-retardant band(s).

BACKGROUND

[0002] A cigarette butt can burn down boundless expanse of forest. There are countless fire cases generated by smoking. A central temperature of a cigarette butt may be up to 700-800 C°, and a surface temperature of a burning cone thereof may be up to 300-500 C°, which is much higher than the burning point of general solid combustibles, such as paper and cloth, etc.

[0003] Cigarettes made of cigarette paper having fire-retardant bands have been applied to effectively improve security of the cigarettes (i.e., low ignition propensity). A method for producing cigarette paper having fire-retardant band is to print a band-shaped fire-retardant coating with a certain interval on a base paper of cigarette paper. When a cigarette naturally burns into an area where the fire-retardant band is located, the fire-retardant band will absorb combustion heat and reduce the entry of oxygen such that the cigarette is self-extinguished, and if someone actively smokes when the cigarette naturally burns into the area where the fire-retardant band is located, the cigarette will acquire oxygen and continue burning.

[0004] The base paper of cigarette paper for producing the cigarette paper having fire-retardant band is a non-printing paper with special characteristics, such as small quantity and high permeability as possessed by the cigarette paper, so that it is difficult to produce qualified cigarette paper having fire-retardant bands by means of a general gravure printing machine.

[0005] Specifically, the cigarette paper having fire-retardant bands is generally produced by printing the fire-retardant on the base paper of cigarette paper by means of the gravure printing machine. However, the inventor, through numerous producing experiments of the general gravure printing machine, finds that the produced cigarette paper having fire-retardant band has some disadvantages, such as wrinkling of paper sheets, large thickness of fire-retardant bands, and gradual decrease in printed amount of fire-retardant.

[0006] The wrinkling of paper sheets will affect the process of cutting the cigarette paper having fire-retardant bands into bobbin papers, affect the wrapping effect of the cigarette making machine, and also affect the appearance of finished cigarettes. The large thickness of the fire-retardant bands will affect the disc diameter of the finished cigarette papers having fire-retardant bands, and also affect the wrapping of the cigarette making machine. The gradual decrease in printed amount of fire-retardant will affect the fire-retardant effect of the cigarette paper having fire-retardant bands.

SUMMARY OF THE INVENTION

[0007] An object of the present invention is to provide a gravure printing machine and a method for producing cigarette paper having fire-retardant bands, which can effectively solve the problems present in existing cigarette paper having fire-retardant bands such as wrinkling of paper sheets, overlarge thickness of the fire-retardant bands, and gradual decrease in printed amount of fire-retardant.

[0008] In order to achieve the above object, the present invention provides a gravure printing machine for producing a cigarette paper having fire-retardant bands, in which the fire-retardant bands are printed on the cigarette paper by means of a fire-retardant printing device. The gravure printing machine comprises a drying device and a pressing device. The drying device comprises a printing machine roller, a rubber engaging roller arranged in parallel to and in contact with the printing machine roller, and a drying cylinder located downstream of the printing machine roller and the rubber engaging roller. The cigarette paper comes into tight contact with the drying cylinder after passing through a contact point between the printing machine roller and the rubber engaging roller. The pressing device comprises an upper pressure roller and a lower pressure roller arranged in parallel to and in contact with the upper pressure roller, in which the cigarette paper passes through a contact point between the upper press roller and the lower press roller.

[0009] Preferably, the gravure printing machine may further comprise a fire-retardant back-flow device that includes a fire-retardant feeding trough connected with the fire-retardant printing device and a back-flow tank connected with the fire-retardant feeding trough via a back-flow pipe. The back-flow tank is also connected with the fire-retardant feeding trough via a feeding pump and a conduit, and the back-flow tank is also provided with a solvent supplement device.

[0010] More preferably, a stirring device may be provided within the back-flow tank.

[0011] Preferably, the drying device may further comprise an drying area of infrared heating air located downstream of the drying cylinder.

[0012] More preferably, the drying cylinder may be connected with a steam heat source or an electrical heat source.

[0013] Preferably, the lower press roller may be provided with a fluid heat source in the interior thereof.

[0014] Another object of the present invention is to provide a method for producing a cigarette paper having fire-retardant bands, comprising a step of printing the fire-retardant on a base paper of the cigarette paper. The method further comprises the following steps: a drying step in which the cigarette paper is conveyed to at least a first stage drying area after the fire-retardant is printed

thereon, and, in the first stage drying area, the cigarette paper is dried by means of a drying cylinder which is in close contact with a sheet of cigarette paper; and a pressing step in which the cigarette paper printed with the fire-retardant bands enters a pressing area after being dried, and then is pressed by the press roller to reduce the coating thickness of the fire-retardant band.

[0015] Preferably, the method may further comprise a step of supplementing fire-retardant by arranging a fire-retardant back-flow tank and establishing a back-flow circulation between a fire-retardant feeding trough and the fire-retardant back-flow tank such that volatile solvent is supplemented to the fire-retardant in the back-flow tank to stabilize the concentration and viscosity of the fire-retardant.

[0016] Preferably, in the drying step, a second stage drying area of infrared heating air may be further provided such that the sheet of the cigarette paper enters the second drying area after passing through the first stage drying area of drying cylinder.

[0017] Preferably, the pressing step may further comprise a step of heating a lower pressing roller by means of a fluid heat source.

[0018] Based on the above technical solutions, the present invention has an advantage that with the gravure printing machine of the present invention, which incorporates a drying device in combination with a pressing device, the paper sheet firstly undergoes a drying process, and then experiences a pressing process. The cigarette paper comes into tight contact with the drying cylinder after passing through a contact point between the printing machine roller and the rubber engaging roller, so that the friction force between the drying cylinder and the paper sheet will reduce the possibility of paper sheet deformation and wrinkling; and further, a certain pressure is exerted on the cigarette paper having fire-retardant bands by means of the upper and lower press rollers when the cigarette paper passes through an arrangement of the upper and lower press rollers, so as to reduce the coating thickness of the fire-retardant band effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are included to provide further understanding of the disclosure and constitute a part of this application, illustrate embodiment(s) of the disclosure and together with the description serve to explain the principle of the disclosure but not constitute improper definition to the present invention. In the drawings:

Fig.1 is a schematic view showing a cigarette wrapped by a cigarette paper having fire-retardant bands of the present invention;

Fig.2 is a structural schematic view showing a fire-retardant back-flow device of the present invention;

Fig.3 is a structural schematic view showing a drying device of the present invention; and

Fig.4 is a structural schematic view showing a pressing device of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] Hereinafter, the present invention will be described in detail with reference to preferred embodiments in conjunction with the accompanying drawings.

[0021] As shown in Figs. 1, 3 and 4, a preferred embodiment of a gravure printing machine for producing a cigarette paper having fire-retardant bands according to the present invention is described. The fire-retardant bands 2 are printed on a cigarette paper 1 by means of a fire-retardant printing device, as shown in Fig. 1. The fire-retardant band 2 of the present invention has a width of 2-8mm. Preferably, the cigarette paper 1 is provided with at least two fire-retardant bands 2, in which two adjacent bands are spaced with respect to each other at a distance of 10-30mm. Preferably, in this embodiment, the fire-retardant band 2 is in a shape of strip and has a width of 6mm, and the adjacent fire-retardant bands are spaced with a distance of 19mm.

[0022] When the cigarette naturally burns into an area where the fire-retardant bands 2 are located, the fire-retardant bands 2 will absorb combustion heat and reduce the entry of oxygen such that the cigarette is self-extinguished. Also, the security can be enhanced by providing with two or more fire-retardant bands 2 to improve retardant frequency. If someone smokes when the cigarette burns into the area of the fire-retardant bands, the cigarette may acquire oxygen and continue burning. It should be noted that the fire-retardant bands of the present invention are not suitable to be too narrow, otherwise, it is difficult to achieve a desired and safe fire-retardant effect. Of course, the fire-retardant bands of the present invention are not suitable to be too wide, otherwise, it will affect the smoker's smoking sense.

[0023] As shown in Fig. 3, the gravure printing machine according to the present invention comprises a drying device and a pressing device. The drying device comprises a printing machine roller 3, a rubber engaging roller 10 arranged in parallel to and in contact with the printing machine roller, and a drying cylinder 12 located downstream of the printing machine roller 3 and the rubber engaging roller 10. The cigarette paper 11 comes into tight contact with the drying cylinder 12 after passing through a contact point between the printing machine roller 3 and the rubber engaging roller 10. The rotational directions of the printing machine roller 3, the rubber engaging roller 10 and the drying cylinder 12 are shown as arrows in Fig. 3. With such a configuration, the friction force between the drying cylinder 12 and the paper sheet of the cigarette paper 11 enables to considerably reduce the possibility of paper sheet deformation and wrinkling. Preferably, the drying device further comprises a drying area of infrared heating air 13 located downstream of the drying cylinder 12, and thus a two-stage drying system

including a first stage drying of drying cylinder and a second stage drying of infrared heating air can be formed, so that a better drying effect can be achieved with a lower cost.

[0024] Furthermore, the drying cylinder 12 is preferably connected with a steam heat source or an electrical heat source, by which a first stage drying process is performed with respect to the cigarette paper 11, and then the sheet of the cigarette paper 11 enters a second stage drying area of infrared heating air.

[0025] As shown in Fig. 4, the pressing device according to the present invention comprises an upper press roller 14 and a lower press roller 15, which are arranged in parallel and contact with each other. The cigarette paper passes through a contact point between the upper press roller 14 and the lower press roller 15. Herein, the upper press roller 14 and the lower press roller 15 according to the present invention are not limited to "upper" and "lower" in physical location. Those skilled in the art will understand that the upper press roller 14 is arranged on one side of the cigarette paper 11 and the lower press roller 15 is arranged on the other side thereof, and the rotational directions of the upper press roller 14 and the lower press roller 15 are shown as arrows in Fig. 4. The coating thickness of the fire-retardant band 2 is effectively decreased since a certain pressure is exerted on the cigarette paper by the upper press roller 14 and the lower press roller 15.

[0026] Preferably, the upper press roller 14 is a rubber roller, and the lower press roller 15 is a steel roller. A fluid heat source is provided inside of the lower press roller 15, for example, the interior of the lower press roller 15 is communicated with hot water for heating. Herein, the fire-retardant bands 2 on the paper sheet of the cigarette paper 11 are softened by heating and then pressed so as to considerably reduce the thickness of the fire-retardant band 2 and improve smoothness of the surface of the fire-retardant band.

[0027] As shown in Fig. 2, preferably, the gravure printing machine according to the present invention further comprises a fire-retardant back-flow device. The fire-retardant back-flow device includes a fire-retardant feeding trough 4 connected with the printing machine roller 3 of the fire-retardant printing device and a back-flow tank 5 connected with the fire-retardant feeding trough 4 via a back-flow pipe 7. The back-flow tank 5 is connected with the fire-retardant feeding trough 4 through a feeding pump 8 and a conduit, and the back-flow tank 5 is further provided with a solvent supplement device 9. With such a configuration, a back-flow circulation is established between the fire-retardant feeding trough 4 and the fire-retardant back-flow tank 5 in the embodiment of the present invention. Accordingly, volatile organic solvent in the fire-retardant can be supplemented into the back-flow tank 5 to keep the concentration and viscosity of the fire-retardant constant so that the printed amount of fire-retardant can be maintained and the product quality can be ensured. Preferably, a stirring device 6 is further provided within the back-flow tank 5, such that various components of the fire-retardant within the back-flow tank 5 can be sufficiently stirred to make them uniformly distributed so as to further ensure stabilization of the fire-retardant printed amount. Therefore, the present invention can effectively solve the technical problem that the printed amount of fire-retardant is gradually deceased in the production circulation.

[0028] On the other hand, the present invention further provides a method for producing a cigarette paper having fire-retardant bands, comprising a step of printing the fire-retardant on a base paper of the cigarette paper. The method further comprises the following steps: a drying step in which the cigarette paper is conveyed to at least a first stage drying area after the fire-retardant is printed thereon, and in the first stage drying area, the cigarette paper is dried by means of a drying cylinder which is in close contact with the sheet of the cigarette paper. Preferably, in the drying step, a second stage drying area of infrared heating air is further provided such that the sheet of the cigarette paper enters the second drying area after passing through the first stage drying area of drying cylinder. The method according to the present invention further comprises a pressing step in which the cigarette paper printed with the fire-retardant bands enters the press area after being dried, and is pressed by the press roller to reduce the thickness of the coating of the fire-retardant bands. More preferably, in the pressing step, a step of heating the lower press roller 15 through the fluid heat source is further included.

[0029] Preferably, the method according to the present invention further comprises a step of supplementing the fire-retardant. By arranging a fire-retardant back-flow tank and establishing a back-flow circulation between the fire-retardant feeding trough and the fire-retardant back-flow tank, volatile solvent is supplemented to the fire-retardant in the back-flow tank to stabilize the concentration and viscosity of the fire-retardant. In the step of supplementing the fire-retardant, a back-flow circulation of the fire-retardant is employed to effectively overcome the disadvantage present in current process that the fire-retardant printed amount is gradually decreased. Specifically, by arranging a fire-retardant back-flow tank 5, a back-flow circulation is established between the fire-retardant feeding trough 4 and the fire-retardant back-flow tank 5. Moreover, the back-flow tank 5 is provided with a stirring device 6 to sufficiently stir various components of the fire-retardant within the back-flow tank 5 to make them uniformly distributed, so as to further ensure stabilization of the printed amount of the fire-retardant. Therefore, the present invention can effectively solve the technical problem that the fire-retardant printed amount is gradually deceased in the production circulation.

[0030] Besides, the present invention employs the combination of the first stage drying process of drying cylinder and the second drying process of infrared heating air. The base paper of cigarette paper is firstly printed with the fire-retardant by means of a printing plate, and

then enters the first stage drying area, i.e., the first drying area of drying cylinder in which the drying cylinder can be heated by steam or electricity. Since the paper sheet closely adheres to the drying cylinder to be heated, generation of the paper sheet deformation and wrinkling is reduced by the friction force between the drying cylinder and the paper sheets, and thereafter, the paper sheets enters the second stage drying area of infrared heating air.

[0031] Furthermore, the method according to the present invention can solve the technical problem that the thickness of the fire-retardant band is too large by using the pressing step of the press roller. Specifically, the cigarette paper having the fire-retardant bands enters the pressing area after being dried; and preferably, the press roller is composed of a rubber roller and a steel roller which is communicated with hot water for heating in its interior. As to the cigarette paper having fire-retardant bands, the coating of the fire-retardant band can be softened by the heating effect of the steel roller, and the thickness of the coating of the fire-retardant can be effectively reduced by applying a certain pressure.

[0032] Obviously, those skilled in the art could devise that various types of printing devices and corresponding production processes can be formed by using the gravure printing machine and method for producing the cigarette papers having fire-retardant bands of the present invention.

[0033] It should be noted that the forgoing embodiments only serve to describe but not be construed as limiting the technical solution of the present invention. The present invention is described in details with reference to the preferred embodiments. Nevertheless, it should be understood for those skilled in the art that various modifications can be made to the specific modes for carrying out the present invention or equivalent alternatives can be made to a part of the technical features without departing from the spirit of the technical solution of the present invention. The modifications and alternatives are therefore intended to be embraced by the technical solution as claimed in the present invention.

Claims

1. A gravure printing machine for producing a cigarette paper having fire-retardant bands that are printed on the cigarette paper by means of a fire-retardant printing device, **characterized in that** the gravure printing machine comprises: a drying device including a printing machine roller (3), a rubber engaging roller (10) arranged in parallel to and in contact with the printing machine roller, and a drying cylinder (12) located downstream of the printing machine roller (3) and the rubber engaging roller (10), the cigarette paper coming into tight contact with the drying cylinder (12) after passing through a contact point between the printing machine roller (3) and the rubber engaging roller (10); and a pressing device including an upper press roller (14) and a lower press roller (15) arranged in parallel to and in contact with the upper press roller, the cigarette paper passing through a contact point between the upper press roller (14) and the lower press roller (15).

2. The gravure printing machine according to claim 1, **characterized in that** the gravure printing machine further comprises a fire-retardant back-flow device that includes a fire-retardant feeding trough (4) connected with the fire-retardant printing device and a back-flow tank (5) connected with the fire-retardant feeding trough (4) via a back-flow pipe (7), the back-flow tank (5) being connected with the fire-retardant feeding trough (4) via a feeding pump (8) and a conduit, and the back-flow tank (5) being provided with a solvent supplement device (9).

3. The gravure printing machine according to claim 2, **characterized in that** a stirring device (6) is provided within the back-flow tank (5).

4. The gravure printing machine according to claim 1, **characterized in that** the drying device further comprises a drying area of infrared heating air (13) located downstream of the drying cylinder (12).

5. The gravure printing machine according to claim 1 or 4, **characterized in that** the drying cylinder (12) is connected with a steam heat source or an electrical heat source.

6. The gravure printing machine according to claim 1, **characterized in that** a fluid heat source is provided in the interior of the lower pressing roller (15).

7. A method for producing cigarette papers having fire-retardant bands, comprising a step of printing the fire-retardant on a base paper of cigarette paper, **characterized in that** the method further comprises:

   a drying step, in which the cigarette paper is conveyed to at least a first stage drying area after the fire-retardant is printed thereon, and, in the first stage drying area, the cigarette paper is dried by means of a drying cylinder being in close contact with a sheet of cigarette paper; and
   a pressing step, in which the cigarette paper printed with the fire-retardant bands enters a pressing area after being dried, and is pressed by a press roller to reduce the coating thickness of the fire-retardant bands.

8. The method for producing cigarette papers having fire-retardant bands according to claim 7, **characterized in that** the method further comprises a step of supplementing fire-retardant by arranging a fire-

retardant back-flow tank and establishing a back-flow circulation between a fire-retardant feeding trough and the fire-retardant back-flow tank, such that volatile solvent is supplemented to the fire-retardant in the back-flow tank to stabilize the concentration and viscosity of the fire-retardant.

9. The method for producing cigarette papers having fire-retardant bands according to claim 7, **characterized in that** in the drying step, a second stage drying area of infrared heating air is further provided, and the sheet of the cigarette paper enters the second stage drying area after passing through the first stage drying area of drying cylinder.

10. The method for producing cigarette papers having fire-retardant bands according to claim 7, **characterized in that** the pressing step further comprises a step of heating a lower pressing roller (15) by means of a fluid heat source.

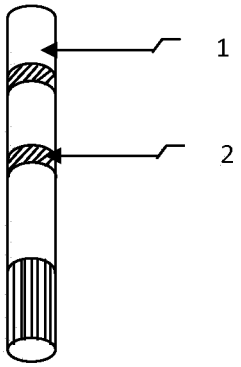


Fig.1

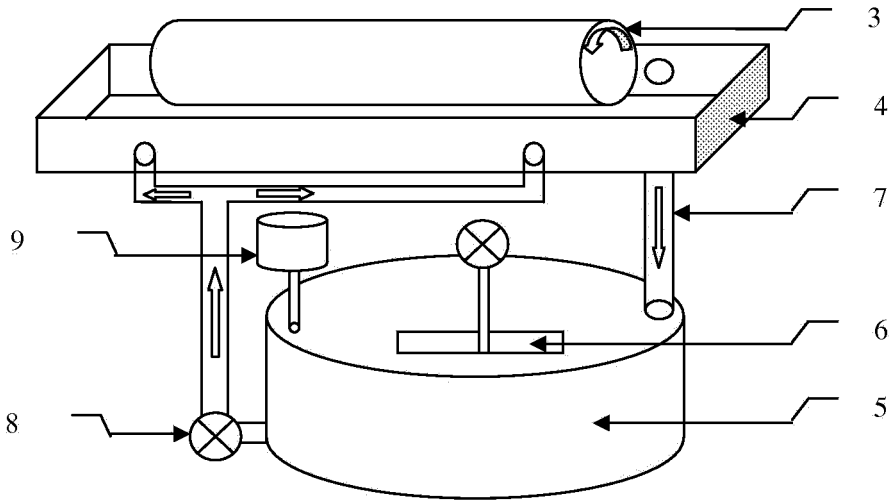


Fig.2

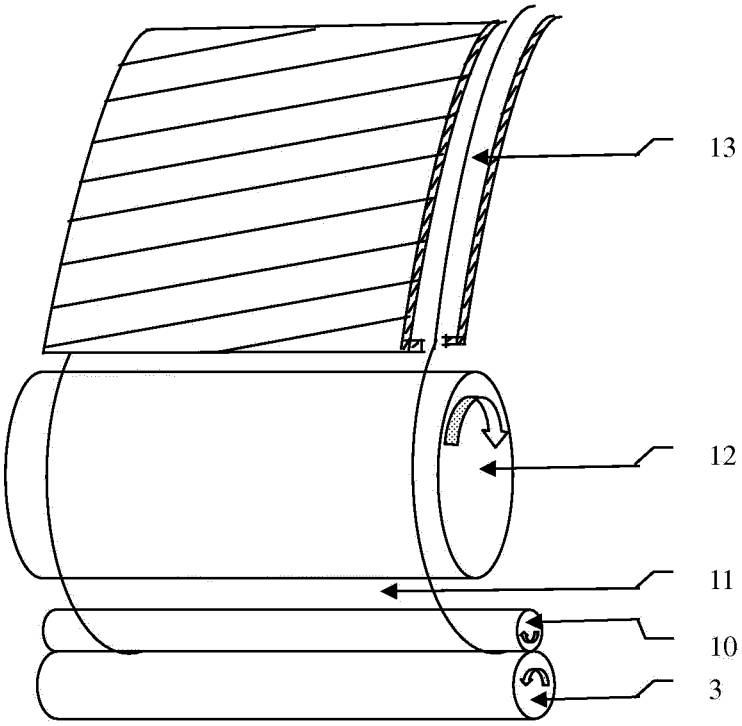


Fig.3

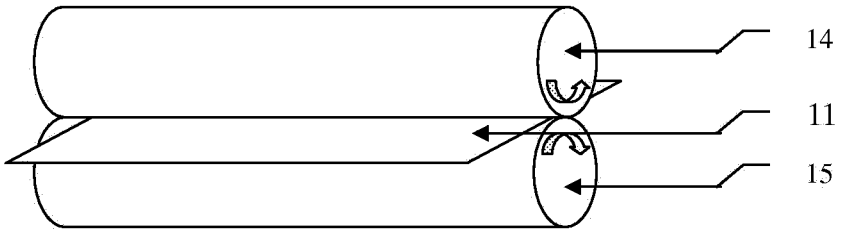


Fig.4