

Feb. 26, 1935.

H. ARNI ET AL

1,992,279

APPARATUS FOR GOFFERING LENTICULATED FILMS

Filed Aug. 6, 1932

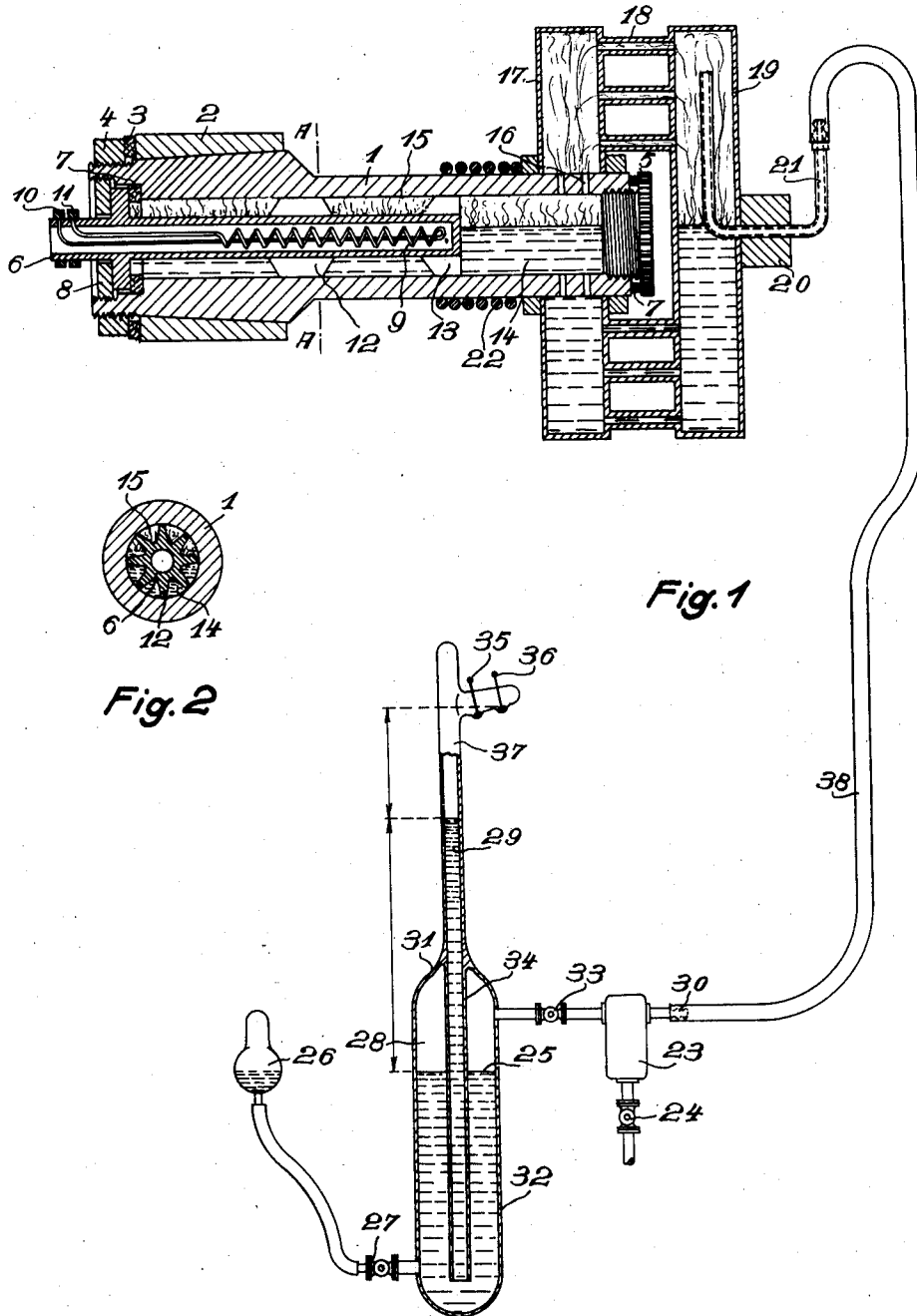


Fig. 1

Fig. 2

INVENTORS
Hans Arni and Johannes Kier
BY Gifford, Smith & Burgess
ATTORNEYS.

UNITED STATES PATENT OFFICE

1,992,279

APPARATUS FOR GOFFERING LENTICULATED FILMS

Hans Arni, Falkensee, near Berlin, and Johannes Thiry, Berlin-Charlottenburg, Germany, assignors to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany, a corporation of Germany

Application August 6, 1932, Serial No. 627,746
In Germany August 8, 1931

8 Claims. (Cl. 18—15)

This invention relates to devices for goffering lenticulated films in such a manner that microscopically small lenticular elements are engraved on a film with the aid of an engraving roller or goffering cylinder.

An advantage of the new device is that it is possible to maintain the roller, during the engraving process, at exactly constant temperature. This results in a considerable uniformity of the films, the lenticular elements obtaining precisely the prescribed shape and size.

In the new goffering machine, the heat is transferred from the electrical heat radiating body to the roller with the help of a fluid medium. The temperature of this fluid is maintained constant with great accuracy.

If attention is then paid to maintaining also the gradient of temperature from the medium to the roller, the constancy of temperature will also be secured for the goffering cylinder.

The temperature of the medium can be maintained constant in a manner well-known in the art. However, it is of special advantage to profit by the fact that the temperature remains absolutely constant, if a body passes from one state to the other, e. g. from the solid to the fluid condition or from the fluid to the vapour condition and that the temperature depends solely on the pressure for a well-defined medium. This pressure is for instance 1.3 atmospheres for water which is to evaporate at approximately 120° C. and can be adjusted and maintained by means of a manostat.

Fig. 1 represents a longitudinal section, Fig. 2 a transverse section in the plane A—A of Fig. 1.

In Fig. 1, the hollow shaft with which the goffering cylinder 2 is connected in a cone-like manner, is designated by 1. The ring 4 equipped with interior thread enables the roller to be firmly fitted on the cone (wound up on the cone) with the washer 3 as intermediate layer, so that a good heat-conducting connection is obtained with shaft 1. The firm connection might also be obtained by imparting to the shaft a higher coefficient of expansion than to the roller which consequently shrinks up as it were, on being heated. The shaft 1 is terminated on one side by a cover 5 and on the other by a heat radiating body 6, each time with the intermediate layer of stuffing rings 7, whereby the heating element is fastened by a ring 8 having an outer thread. The heat radiating body 6 contains a resistance winding 9, to which the electric current is led through slip rings 10, 11. At the outside it is equipped with the longitudinal ribs 12, 13 shown in Fig. 2

in section. These ribs which support the heating element within tubing 1 are so designed as to prevent, within the limits possible, direct heat transfer through the ribs to shaft 1. The clearance between them is sufficiently large to enable the fluid and the vapour to have free flow and to wash round the shaft 1. At one of the ends, the shaft has, in addition, radial channels 16, which terminate at a disc-shaped chamber 17 and permit of the leak of vapour 15 or of the supply of fluid 14. The condenser 19 which is cooled in a manner well-known in the art, by irrigation or by cooling ribs and ventilator and in which the vapour is deposited and again introduced into the fluid in a circular course, is connected with chamber 17 through tubings 18. A stuffing box 20 is in addition introduced as pressure tube 21 into the upper part of the condenser which part is connected to a manostat by means of hose 38 for maintaining the pressure. 22 designates an electric winding on the shaft 1, which owing to additional heating keeps small the gradient of temperature along the shaft.

This manostat consists essentially of two communicating vessels containing mercury of which one is fitted with electrical contacts. A glass vessel 32 of a rather large diameter is at 31 fused with a longer glass tube 34, sealed at one end and immersed with the open end into the mercury. The upper space 37 of vessel 34 which has the electrical contact studs 35, 36 arranged in a lateral bulge so as to make project them into cups like the well-known switching relay contacts, is preferably evacuated so that the pressure present in space 28 and corresponding to the vapour tension is only received by the weight of the column of mercury 29. The contact is achieved at 35 and 36 in much the same manner as for vacuum contacts. The vapour chamber is connected between 21 and 30 through tubings. Except for 21 the junction can be stopped by the cock 33. 23 designates a collecting vessel for the amount of fluid condensing in the junction line. This fluid can be made to escape, if cock 24 is opened. This prevents the formation of a liquid layer on the mercury level 25. The height of the vapour pressure and consequently of the temperature of the engraving roller is obtained by regulating the amount of mercury with the aid of vessel 26 adjustable to different height and filled with mercury and of a stop cock 27. The contacts 35, 36 are connected to a source of voltage and to an electric relay, through which heating windings of the heat radiating body 2 are connected, for instance in parallel, or partly disconnected. The

contacts and cups are shifted in height with respect to one another, so as to prevent them to come simultaneously in contact when the mercury column 29 rises. The device must also be strongly
 5 damped in order to avoid the occurrence of mechanical vibrations. Owing to the fact that the vessel containing contacts 35 and 36 is hermetically sealed, the pressure within the roller is made independent of the outer atmospheric
 10 pressure.

As compared with the devices used up to now for keeping the roller at a constant temperature in which the heating of the roller is directly effected by an electrically heated resistance, the
 15 use of a fluid or even a gas kept at a constant temperature, has the advantage that the heat capacity is essentially greater than that of the spiral, so that fluctuations in temperature are sufficiently slow to enable them to be easily kept within the permissible limits. In addition, the
 20 temperature of the whole fluid is almost equal, so that a thermometer really indicates the actual heating temperature, whereas in the known devices the thermometer must be placed at a
 25 distance from the roller and from the heater.

In the new machine the maintenance of the temperature is, in addition, reduced to the keeping constant of the pressure, which is practically more easily achievable. Furthermore, a very accurate control of the heat supply can be dispensed with, since the excess in heat acts only on the
 30 speed at which the condition varies, and not on the height of the temperature. Instead of varying the boiling pressure it is also possible to choose the composition of the fluid, for instance of a
 35 solution in such a manner that the desired temperature is at a pressure which must be kept constant but can readily be adjusted. As fluid medium for transferring heat, use should be
 40 made of water or another fluid evaporating at the prescribed temperature under a suitable pressure. The addition of salts or a mixture permits of a favourable choice of the boiling point. Within the limits possible, no fluid should be lost, as
 45 this would change the concentration or composition and thereby the boiling point. The bearing of the shaft in such a manner that the end carrying the roller is accessible, permits of easily interchanging the cylinder. An unnecessary leak
 50 of heat is furthermore avoided by thermally insulating the bearings and similar parts from the shaft, as for instance, roller- or ball-bearings only allow a small amount of heat to pass.

Besides the heating of the fluid in such a manner that an electrical heating element is introduced into the hollow space of the shaft, while being electrically insulated from the fluid, the fluid itself also can serve as current path or line
 55 resistance. A heating by induction may also be of advantage under certain conditions.

If lenticulated films are goffered by means of the new device, the roller must be brought to a temperature at which the celluloid has the required plasticity. This temperature is in general
 65 slightly above 100° C. and it is kept constant with considerable accuracy within fractions of a degree during the working process of about 8 hours, though the cylinder is permanently in rotation when film is goffered. The cylinder is in addition
 70 easily interchangeable and accessible and permits of observing the film also during the goffering process. The high precision required for the working process is secured by the possibility of an
 75 exact adjustment of the cylinder.

We claim as our invention:

1. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber within said shaft and extending into the part of said
 5 shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying fluid to said chamber, and means for maintaining the temperature of said fluid substantially constant.

2. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber within said shaft and extending into the part of said shaft within said cylinder, an electric heating element
 15 disposed within said chamber, means for supplying a fluid to said chamber, means for maintaining the temperature of said fluid substantially constant, and means for maintaining the gradient of temperature between said fluid and said cylinder substantially constant.

3. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber within said shaft and extending into the part of
 25 said shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying a fluid to said chamber, means for maintaining the temperature of said fluid substantially constant, a condenser to condense vapor from said fluid, and connections from said condenser to said chamber to take vapor therefrom and to return condensate thereto.

4. In a device for goffering films having a rotatable shaft with a goffering cylinder within
 35 which said shaft is disposed, a fluid chamber within said shaft and extending into the part of said shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying a fluid to said chamber, and means
 40 for maintaining the temperature of said fluid substantially constant by controlling the pressure of said fluid in said chamber.

5. In a device for goffering films having a rotatable shaft with a goffering cylinder within
 45 which said shaft is disposed, a fluid chamber within said shaft and extending into the part of said shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying a liquid to said chamber to be vaporized therein by said heating element, and means for controlling the pressure of said vapor.

6. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber
 55 within said shaft and extending into the part of said shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying a liquid to said chamber to be vaporized therein by said heating element, means
 60 for controlling the pressure of said vapor, said last-named means comprising two vessels connected with each other at the bottom and filled with a second fluid, one of said vessels containing said vapor above said second fluid, the other
 65 of said two vessels being equipped with means for controlling the heat of said heating element, and said means being affected by said second fluid.

7. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber within said shaft and extending into the part of said shaft within said cylinder, an electric heating element disposed within said chamber, 75

means for supplying a liquid to said chamber to be vaporized therein by said heating element, means for controlling the pressure of said vapor, said last-named means comprising two vessels connected with each other at the bottom and filled with mercury, one of said vessels containing said vapor above said mercury, the other of said two vessels being equipped with means for controlling the heat of said heating element, and said means being affected by said mercury.

8. In a device for goffering films having a rotatable shaft with a goffering cylinder within which said shaft is disposed, a fluid chamber

within said shaft and extending into the part of said shaft within said cylinder, an electric heating element disposed within said chamber, means for supplying a fluid to said chamber, means for maintaining the temperature of said fluid substantially constant, a condenser to condense vapor from said fluid, connections from said condenser to said chamber to take vapor therefrom and to return condensate thereto, and means to maintain the pressure in said condenser substantially constant.

HANS ARNI.

JOHANNES THIRY.