Dec. 7, 1937. E. GEBAUER-FUELNEGG ET AL 2,101,138

APPARATUS FOR REACTING STRIP MATERIAL WITH A LIQUEFIED REAGENT

Original Filed Feb. 6, 1935 2 Sheets-Sheet 1

Fig. 1.

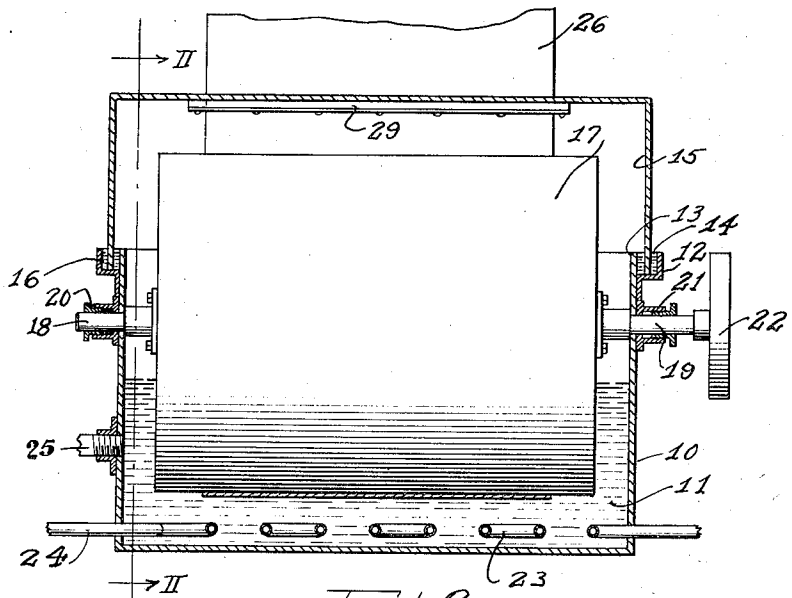
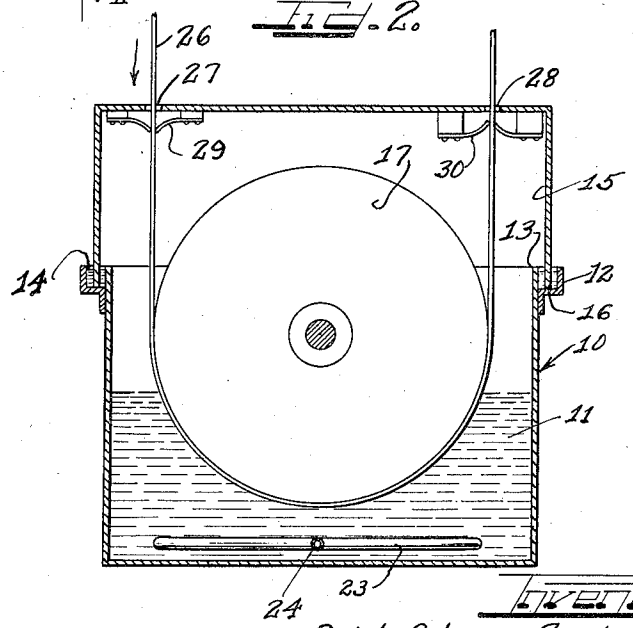


Fig. 2.



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Fig. 3.

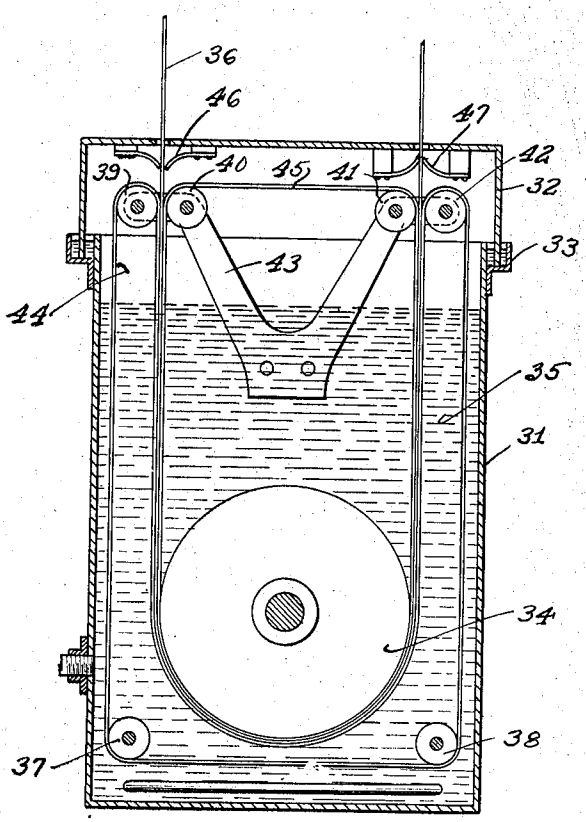
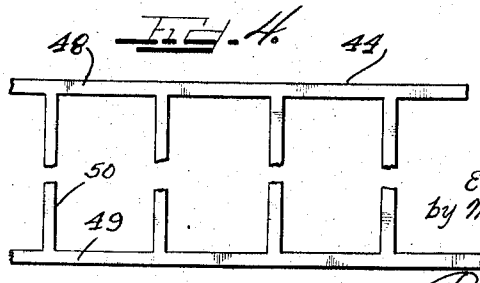


Fig. 4.



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UNITED STATES PATENT OFFICE

2,101,138

APPARATUS FOR REACTING STRIP MATERIAL WITH A LIQUEFIED REAGENT

Erich Gebauer-Fuelnegg, deceased, late of Evanston, Ill., by Marie Gebauer-Fuelnegg, administratrix, Evanston, Ill., and Edouard M. Kratz, Gary, Ind., assignors, by mesne assignments, to Marbo Patents Inc., a corporation of Delaware

Application February 6, 1935, Serial No. 5,218
Renewed June 13, 1936

3 Claims. (Cl. 23—285)

This invention relates to an apparatus for reacting strip material with a liquefied reagent, and more particularly to apparatus suitable for carrying out the reaction between liquefied hydrogen chloride, liquefied chlorine, or other liquefied hydrohalide or halogen, and rubber in a continuous process.

In the application of Erich Gebauer-Fuelnegg, Eugene W. Moffett and Henry F. Irving, entitled "Apparatus and continuous process for reacting organic web materials with liquefied reagents", Serial No. 739,554, filed August 13, 1934, there is a disclosure of apparatus of this general type. The present invention is that of a different form of apparatus which is also suitable for use in the carrying out of reactions between strip material and liquefied reagents.

It is an object of the present invention to provide an apparatus for carrying out in a continuous manner the reaction between strip material and a liquefied reagent, with means for maintaining the liquefied reagent at a temperature below its boiling or volatilizing point and means for sealing the apparatus against loss of any volatilized reagents.

It is a further important object of this invention to provide an apparatus in which strip material may be continuously reacted with a liquefied reagent at extremely low temperatures, the apparatus including a relatively large diameter roll adapted to be immersed within the liquefied reagent and to carry the strip material into contact with said reagent.

Other and further important objects of this invention will become apparent from the following description and appended claims.

On the drawings:

Figure 1 is a vertical sectional view of apparatus embodying the principles of the invention, with parts in elevation.

Figure 2 is a sectional view taken substantially on the line II—II of Fig. 1.

Figure 3 is a vertical sectional view of a modified form of the apparatus.

Figure 4 is a broken, enlarged view of a conveyor belt for use with the apparatus of Fig. 3.

As shown on the drawings:

The reference numeral 10 (Figs. 1 and 2) indicates a tank or receptacle for containing a liquefied reagent 11. Said tank is preferably rectangular in shape and is open at its upper end, with a sealing trough 12 extending completely around the upper edge 13. Said trough 12 is adapted to be filled with a sealing fluid 14, such as a heavy mineral oil or other inert liquid. A cover 15 is adapted to be fitted over the tank 10 with its lower edges 16 extending into said trough 12 and resting on the bottom thereof. The sealing fluid 14 thus effects a seal between the cover 15 and the tank 10 when the cover is positioned in place.

A relatively large diameter roll 17 is mounted within the tank 10 with its journals 18 and 19 extending through the side walls of the tank and supported therein. Packing glands 20 and 21 are provided for the journals 18 and 19, respectively. The journal 19 is extended to provide a driving connection 22, whereby the roll 17 may be rotated at a suitable speed.

Coils 23 are positioned in the bottom of the tank 11, or in any other suitable position, for the circulation of a refrigerant to maintain the liquefied reagent at the proper temperature below its boiling or volatilization point. A pipe 24 connected to the coils 23 forms a part of the refrigerant cycle.

The tank 10 is provided with an inlet pipe 25 for the introduction of a liquefied reagent into the tank. The level of the liquefied reagent within the tank is maintained at a sufficient height to immerse a substantial portion of the periphery of the roll 17.

Strip material, indicated at 26, is introduced through an opening or slot 27 in the cover 15 and is trained around the roll 17 and passes out through an opening or slot 28 also in the cover 15. Said openings 27 and 28 are sealed by means of seals 29 and 30, respectively. Each of said seals 29 and 30 comprises strips of flexible material resiliently contacting the surfaces of the strip material 26. A plurality of such seals can be used at the adit and exit of the tank, if desired.

The modified form of the apparatus disclosed in Figs. 3 and 4 comprises a relatively deeper tank 31 having a cover 32 therefor. The joint between the cover 32 and the tank 31 is sealed by means of a liquid seal 33 similar to that already described. A roll 34 is mounted within the tank 31 and journaled in the walls thereof. A body of liquefied reagent 35 is maintained within the tank 31 up to a level just below the top edge of the tank.

Guiding means for the strip material 36 comprises a plurality of rollers 37 and 38 mounted near the bottom of the tank and other sets of rollers 39, 40, 41, and 42 supported on brackets 43 from the side walls of said tank 31. A pair of conveyor belts 44 and 45 are trained around said rollers, the outside belt 44 being trained around

the rollers 39, 37, 38, 42 and the large roll 34, while the inside belt 45 is trained around the rollers 40 and 41 and the large roll 34. Seals 46 and 47 are provided at the adit and exit openings in the cover 32.

The strip material 36 passes through the seal 46 and in between the belts 44 and 45 as they pass between the rolls 39 and 40. Said belts 44 and 45 serve to guide the strip material 36 around the roll 34 and back out between the rollers 41 and 42 for removal through the seal 47 from the tank.

Each of the belts 44 and 45 may suitably be formed from thin, ribbon metal with longitudinally extending strips 48 and 49 joined by transverse strips 50. The belts may be made of any suitable material that is not attacked by the liquefied reagent. Where the apparatus is being used for reacting rubber with liquefied hydrogen chloride or chlorine, the belts may suitably be formed of tantalum, since this metal is not attacked by these reagents.

Since the apparatus of our invention has been particularly devised for the carrying out of the reaction between rubber, and rubber-like substances, with hydrohalides or halogens, its operation will be described in that connection. Before running the liquefied reagent into the tank, the strip of rubber is threaded through the entrance seal in the cover around the driven roll and out through the seal for the exit in the cover. In order to accomplish this, the cover may, of course, be elevated sufficiently to facilitate the threading operation. The cover is then set in place and the joints between the cover and tank sealed by means of a sealing liquid. The liquefied reagent is then introduced into the tank up to the desired depth and the refrigerant cycle set in operation to maintain the liquefied reagent within the tank at the proper temperature. The roll 17 or 34 is then driven at the proper speed to effect the reaction between rubber and the liquefied reagent. such as hydrogen chloride. This reaction proceeds rapidly and goes to substantial completion within a minute or so. The speed of rotation of the driven drum is therefore so controlled as to hold the strip of rubber in contact with the liquefied reagent for the period of time required to carry the reaction to the degree of completeness desired.

It is known that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and therefore, it is not the purpose to limit the patent granted hereon otherwise than necessitated by the prior art.

What is claimed as the invention is:

1. Apparatus for reacting strip material with a liquefied reagent, comprising a tank for said liquefied reagent, a removable cover for said tank, sealing means associated with said tank for sealing the joint between said cover and tank, a roll within said tank for carrying strip material into contact with said reagent, means for driving said roll, refrigerating means within said tank and continuous flexible reticulated belts trained to contact said roll for guiding said strip material about said roll.

2. Apparatus for reacting strip material with a liquefied reagent, comprising a tank for said liquefied reagent, a removable cover for said tank, sealing means associated with said tank for sealing the joint between said cover and tank, said cover having openings for the passage therethrough of strip material and seals for said openings, a roll within said tank for carrying strip material into contact with said reagent, means for driving said roll, refrigerating means within said tank and continuous flexible reticulated belts trained to contact said roll for guiding said strip material about said roll.

3. Apparatus for reacting strip material with a liquefied reagent, comprising a tank for said liquefied reagent, a driven roll within said tank adapted to be immersed in said reagent, refrigerating means in said tank, a pair of reticulated belts trained to lap said roll, rollers mounted in said tank to guide said belts, a cover for said tank having sealed openings for the passage of strip material therethrough and liquid means for sealing said cover to said tank.

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EDOUARD M. KRATZ.