Aug. 10, 1926. 1,595,476

O. MINTON

METHOD AND APPARATUS FOR CLEANING LIQUID SEALS OF VACUUM CHAMBERS

Original Filed May 25, 1920 2 Sheets-Sheet 1

FIG 1

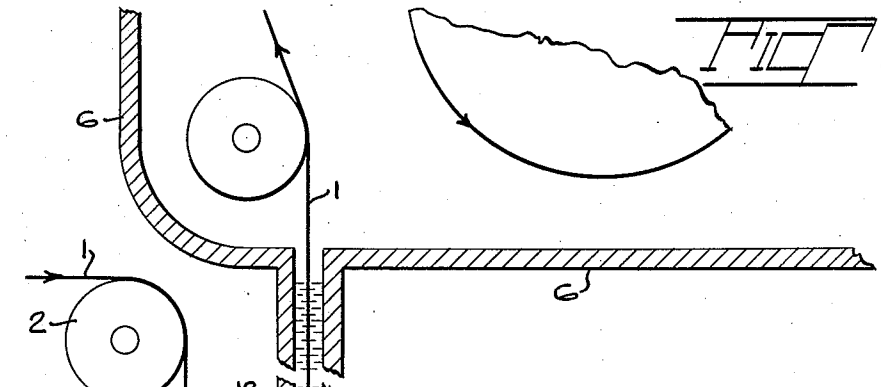
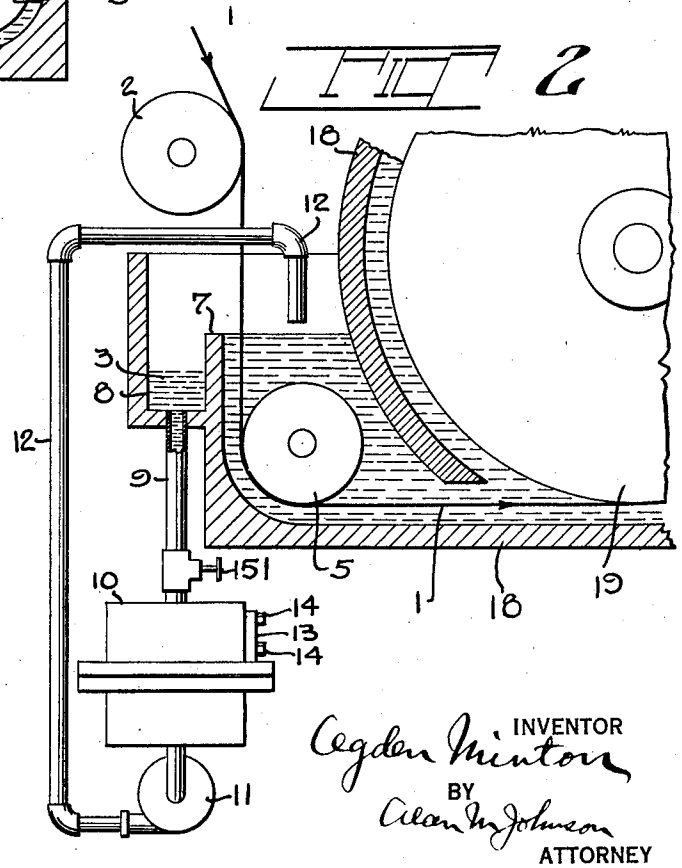


FIG 2



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FIG 3

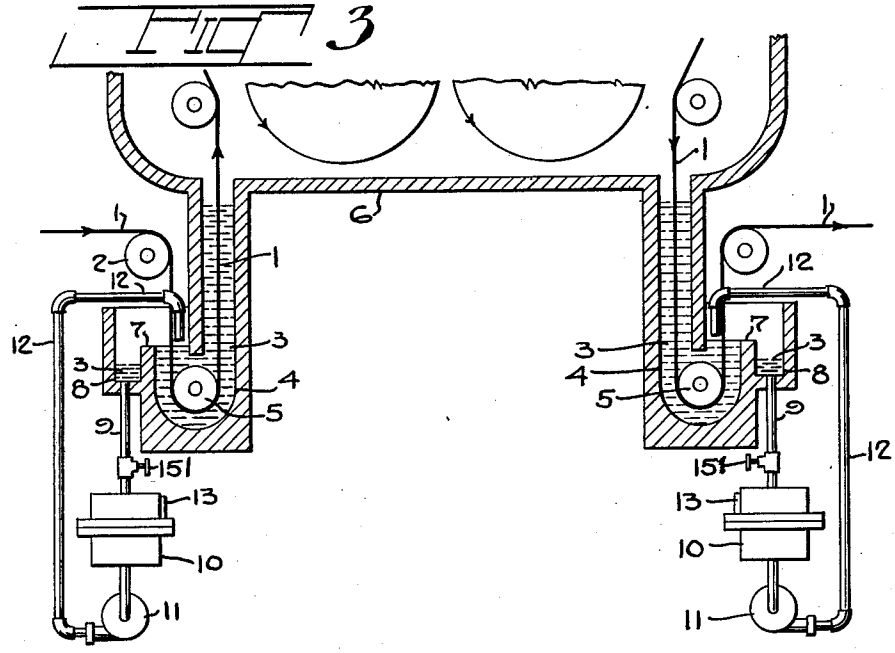
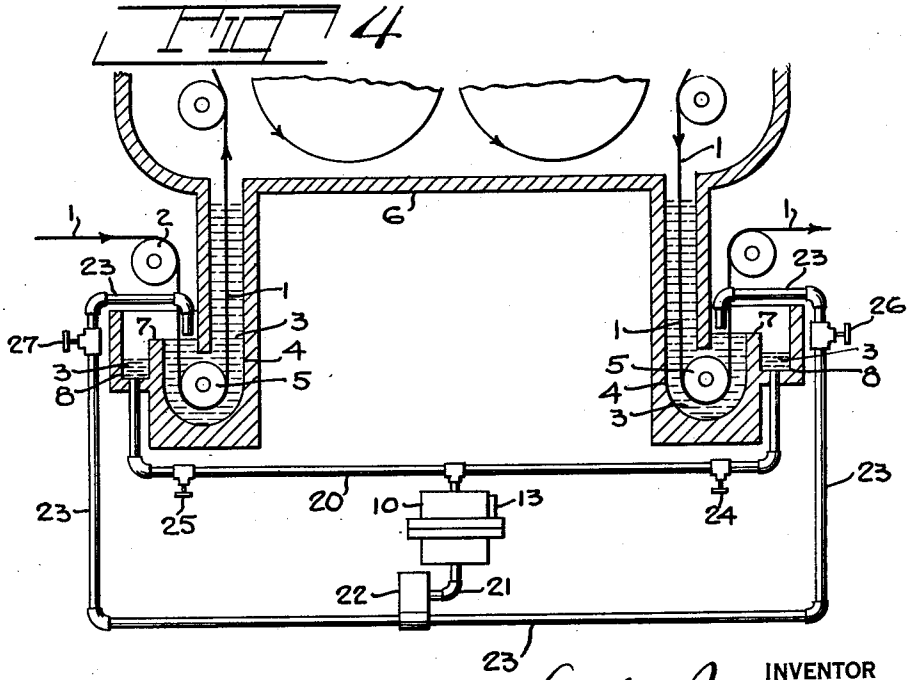


FIG 4



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METHOD AND APPARATUS FOR CLEANING LIQUID SEALS OF VACUUM CHAMBERS.

Application filed May 25, 1920, Serial No. 384,211. Renewed February 17, 1926.

My invention relates to cleaning the liquid seal of a vacuum apparatus and more particularly a vacuum drying apparatus. In such a drying apparatus a web of paper, fabric or similar sheet material, is fed into a vacuum chamber to dry it, first passing through a liquid seal of some medium which has no affinity for, or deleterious effect upon, said sheet material. The web, or portions of it, will often carry foreign matter, as dirt, grease, fibers, oil and other foreign matter, which is more or less removed by the liquid seal and forms a scum which will float upon the surface of the liquid seal. Other and cleaner portions of the same or another web will take up this scum and be marred by it. My invention is to remove this foreign matter from the liquid seal.

My invention further relates to cleaning the liquid seal without breaking the vacuum in the chamber. My invention further relates to permitting a portion of the liquid seal to escape from the sealing chamber, be cleaned and returned to the sealing chamber without breaking the vacuum in the chamber.

My invention further relates to certain methods, apparatus, combinations, and details which will be more fully hereinafter described and set forth in the claims.

In the accompanying drawings the same reference numerals refer to similar parts in the several figures.

Fig. 1 is a vertical section of one form of apparatus, which may be used to carry out my improved method, shown connected to one form of vacuum drying chamber;

Fig. 2 is a vertical section of one form of my apparatus shown connected to a different form of vacuum drying chamber;

Fig. 3 is a vertical section of two of my cleaning apparatus connected to different liquid seals of a vacuum drying chamber;

Fig. 4 is a vertical section, similar to Fig. 3, except that the parts are so coupled together that one cleaning chamber and pump is used instead of the two separate units shown in Fig. 3.

In passing a wet web 1 of paper, or fabric or other sheet material over the guide roll 2 and through the liquid sealing medium 3 mounted in the sealing chamber 4, under the guide roll 5, and thence into the vacuum drying chamber 6 it is found that the liquid sealing medium 3 will often, in parts of the run of the web 1, become foul with foreign matter, such as dirt, oil, fibers, and other material which will be more or less removed from the web 1 by the liquid sealing medium 3. This foreign matter forms a scum which floats upon the surface of the seal 3. A portion of the run of paper, cloth, or other material, which is to be dried in the vacuum chamber 6, may be comparatively dirty and that portion of the foreign matter which is removed from the web will float upon the liquid seal and form a scum. Other and cleaner portions of the same or another web will take up all, or a large portion, of this scum, but in doing so the web of course will be injured or marred.

By my invention I provide the sealing chamber 4 with a weir or dam 7 and with a well 8. This well is connected by means of the pipe 9 with a cleaning chamber 10. Also connected to the cleaning chamber is a pump 11 with its pipe 12 leading back to the sealing chamber 4. In practice I employ a little more liquid sealing medium 3 than is necessary to fill the sealing chamber 4 up to the weir or dam 7. This scum of foreign matter floats on the surface of the liquid sealing medium 3, and as there is a little more liquid than necessary to fill the chamber 4, the scum will flow over the weir or dam 7 into the well 8 and then through the pipe 9 into the cleaning chamber 10, where it will be cleaned and the foreign matter removed; thence through the pump 11, and pipe 12, back to the sealing chamber 4. The foreign matter is retained in the cleaning chamber 10. From time to time this foreign matter may be removed by any suitable means, such as by removing the plug 13 by loosening the bolts 14, 14. During the cleaning operation the valve 151 may be used to close the entrance to the cleaning chamber 10.

Different sealing mediums 3 may be used which will not injure or mar the web 1 and which have no affinity for, or deleterious effect, upon the web. I may for example use mercury, amalgam, or any other similar liquid having the characteristics above specified. When mercury or similar material is employed the dirt, oil, fibers, oxide of mercury, if any, and all other foreign matter will form the scum which will flow over the weir or dam 7.

I have shown the cleaning chamber 10 equipped to clean mercury, though of course it is to be understood that it may be

equipped differently for different forms of liquid sealing mediums which may be used. When mercury or similar material is used I employ a cloth, or chamois skin, or skins 15 stretched across the interior of the cleaning chamber 10, through which the mercury is drawn by the pump 11. The clean mercury passes into the compartment 16 of the cleaning chamber and is fed back into the sealing chamber 4 by the pump 11 and pipe 12. The scum, and other foreign matter, is held in the compartment 17 of the cleaning chamber and is removed from time to time by removing the plug 13. After closing the valve 151 the level of the liquid in the separating or clearing chamber 10 is lowered so as to be below the plug 13. This permits the scum and foreign matter to be readily removed without wasting any of the sealing liquid.

In Fig. 1 I have shown my method and apparatus in connection with one liquid seal of a vacuum chamber 6. It of course can be applied to any form of vacuum chamber using a liquid seal. In Fig. 2 I have shown, by way of example, a vacuum chamber 18 equipped with my invention in which the web 1 of paper or similar sheet material is fed over the guide roll 2, under the guide roll 3 and thence in contact with the guide cylinder 19 partly surrounded by the liquid sealing medium, which is preferably, as previously stated, mercury, amalgam or some similar material. This particular form of vacuum chamber for drying a web of paper or similar sheet material is the subject of my companion application Ser. No. 384,212, filed herewith.

In Fig. 3 I have shown a vacuum chamber, such as 6 as in Fig. 1, provided with two sealing chambers 4, 4 each of which is provided with a liquid seal 3. The structure shown in this figure is the same as that shown in Fig. 1, except that there are two units, one for each separate seal. Instead of two separate and distinct units I may, as in Fig. 4, connect the wells 8, 8 of the two sealing chambers 4, 4 by means of the pipe 20, connecting this pipe directly with one cleaning chamber 10, which in turn is connected by means of the pipe 21, with one pump 22, that pump pumping the clean mercury or amalgam or other similar liquid sealing medium, through the pipe 23 to each of the liquid sealing chambers 4, 4. If desired, the pipe 20 may be provided with valves 24 and 25 and the pipe 23 may be provided with valves 26, 27 so that the cleaning may be confined to either one or both of the sealing chambers 4, 4 as may be found expedient or convenient.

Having thus described this invention in connection with illustrative embodiments thereof, to the details of which I do not desire to be limited, what is claimed as new and what is desired to secure by Letters Patent is set forth in the appended claims.

What I claim is:—

1. The method of cleaning a liquid seal of a vacuum apparatus consisting in automatically removing a portion of said liquid seal without breaking the vacuum, removing the scum or other foreign matter from that portion of the liquid seal, and automatically returning said cleaned portions to the liquid seal.

2. The method of cleaning the liquid seal of a vacuum apparatus consisting in using a greater quantity of liquid than necessary to seal the vacuum apparatus, and permitting the surplus liquid to escape from the seal, cleaning said surplus liquid, and returning it to the liquid seal.

3. The method of cleaning the liquid seal of a vacuum apparatus consisting in using a greater quantity of liquid than necessary to seal the vacuum apparatus, permitting the surplus liquid to flow over a weir or dam, cleaning said surplus liquid, and returning it to the seal.

4. The method of continuously cleaning the liquid of a vacuum apparatus consisting in using a greater quantity of liquid than necessary to seal the vacuum apparatus, and permitting the surplus liquid to continuously escape from the seal, continuously cleaning said surplus liquid, and continuously returning it to the liquid seal.

5. The method of continuously cleaning the liquid seal of a vacuum apparatus consisting in using a greater quantity of liquid than necessary to seal the vacuum apparatus, continuously permitting the surplus liquid to flow over a weir or dam, continuously cleaning said surplus liquid, and continuously returning it to the seal.

6. The method of cleaning the liquid seal of a vacuum apparatus consisting in withdrawing some of the liquid of the seal, passing it through a cleaner, and returning the cleaned liquid to the seal.

7. The method of sealing a vacuum chamber by a liquid and at the same time keeping the liquid clean so that it will not injure any material passing through it into the vacuum chamber to be treated, consisting in withdrawing some of the liquid of the seal without breaking the vacuum in the vacuum chamber, forcing it through a cleaner and returning the cleaned liquid to the seal.

8. The method of cleaning a liquid seal of mercury or similar material for a vacuum chamber, consisting in removing from the mercury foreign matter which the mercury may accumulate and returning it to the seal.

9. The method of keeping a liquid seal of mercury or similar material free from foreign matter consisting in withdrawing portions of said mercury or similar material, cleaning said portions and returning the

cleaned mercury or similar material to the seal.

10. The method of maintaining a vacuum in a vacuum chamber by means of a liquid seal and keeping the seal free from foreign matter, consisting in withdrawing portions of the sealing medium without breaking the vacuum, cleaning it to remove all foreign matter, and returning the cleaned sealing medium without disturbing the vacuum in the vacuum chamber.

11. The method of maintaining a vacuum in a vacuum chamber by means of a liquid seal of mercury or similar material and keeping the mercury or similar material free from foreign matter, consisting in withdrawing portions of the mercury or similar material without breaking the vacuum, cleaning it to remove all foreign matter, and returning the cleaned mercury or similar material without disturbing the vacuum in the vacuum chamber.

12. The method of maintaining a vacuum in a vacuum chamber by means of a liquid seal and keeping the seal free from foreign matter, consisting in automatically withdrawing portions of the sealing medium without breaking the vacuum, cleaning it to remove all foreign matter, and returning the cleaned sealing medium without disturbing the vacuum in the vacuum chamber.

13. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a liquid seal, and means to clean said liquid seal of foreign matter without breaking the vacuum in the vacuum chamber.

14. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a weir or dam, a liquid seal a portion of which is adapted to flow over the weir or dam, and means to treat said overflowing liquid to remove foreign matter, and return the cleaned liquid to the sealing chamber.

15. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a weir or dam, a well connected to a cleaning chamber, a cleaning chamber, a liquid sealing medium, and means to force different portions of said liquid sealing medium through the cleaning chamber to remove foreign matter from said liquid, and return the cleaned sealing liquid to the sealing chamber.

16. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a weir or dam, a liquid seal of mercury or similar material, a portion of which is adapted to flow over the weir or dam, and means to treat said overflowing mercury or similar material to remove foreign matter, and return the cleaned mercury or similar material to the sealing chamber.

17. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a weir or dam, a well connected to a cleaning chamber, a cleaning chamber, mercury or similar material located in the sealing chamber, and means to force different portions of said mercury or similar material through the cleaning chamber to remove foreign matter from said mercury or similar material, and return the cleaned mercury or similar material to the sealing chamber.

18. In a vacuum apparatus the combination of a vacuum chamber, a liquid sealing chamber, a weir or dam, a well connected to a cleaning chamber, a cleaning chamber, a strainer mounted in the cleaning chamber, mercury or similar material mounted in the sealing chamber to seal the vacuum chamber there being a little more mercury or similar material than necessary to fill the sealing chamber, and a pump to force the mercury or similar material through the strainer in the cleaning chamber, and feed the cleaned mercury or similar material back to the sealing chamber.

19. The method of drying sheet material and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, treating the sheet material in the vacuum chamber, and removing a portion of said liquid seal without breaking the vacuum maintained by the seal or stopping the passage of the sheet material into and out of the vacuum chamber, cleaning said removed portion of the liquid seal, and returning the cleaned liquid to the seal so that the sheet material will be kept clean as it passes through the seal.

20. The method of drying a web of paper and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, treating the web of paper in the vacuum chamber, and removing a portion of said liquid seal without breaking the vacuum maintained by the seal or stopping the passage of the web of paper into and out of the vacuum chamber, cleaning said removed portion of the liquid seal, and returning the cleaned liquid to the seal so that the web of paper will be kept clean as it passes through the seal.

21. The method of drying sheet material and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, treating the sheet material in the vacuum chamber, and automatically removing a portion of said liquid seal without breaking the vacuum maintained by the seal or stopping the passage of the sheet material into and out of the vacuum chamber, automatically cleaning said removed portion of the liquid seal, and automatically returning the cleaned liquid to the seal so that the sheet material will be kept clean as it passes through the seal.

22. The method of drying a web of paper and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, treating the web of paper in the vacuum chamber, and automatically removing a portion of said liquid seal without breaking the vacuum maintained by the seal or stopping the passage of the web of paper into and out of the vacuum chamber, automatically cleaning said removed portion of the liquid seal, and automatically returning the cleaned liquid to the seal so that the web of paper will be kept clean as it passes through the seal.

23. The method of drying a wet web of paper and keeping the web clean consisting in passing the web through a mercury seal or similar material sealing the entrance and exit passages of a vacuum chamber, drying the wet web in the vacuum chamber, withdrawing it through a mercury seal, and removing a portion of said mercury or similar material without breaking the vacuum maintained by the seal or stopping the passage of the web into and out of the vacuum chamber, cleaning said removed portion of the seal and returning the cleaned mercury or similar material to the seal, so that the web will be kept clean as it passes through the seal.

24. The method of treating sheet material and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, treating the sheet material in the vacuum chamber, circulating an excess quantity of liquid through the liquid seal, and withdrawing the excess liquid containing the impurities, cleaning said excess liquid, and returning it to the liquid seals.

25. The method of treating a web of wet paper and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, drying the web of paper in the vacuum chamber, circulating an excess quantity of liquid through the liquid seal, and withdrawing the excess liquid containing the impurities, cleaning said excess liquid, and returning it to the liquid seals.

26. The method of treating a web of wet paper and keeping it clean consisting in passing it through a liquid seal of a vacuum chamber, drying the web in the vacuum chamber, permitting an excess quantity of the liquid of the liquid seal to flow with its impurities into a well, withdrawing the excess liquid and impurities from the well, cleaning it, and then returning the cleaned liquid free of the impurities to the liquid seal.

27. The method of treating a web of wet paper and keeping it clean consisting in passing it through a circulating liquid of a liquid seal of a vacuum chamber, drying the web in the vacuum chamber, permitting an excess quantity of the circulating liquid of the liquid seal to flow with its impurities into a well, withdrawing the excess liquid and impurities from the well, cleaning it, and then returning the cleaned circulating liquid free of the impurities to the liquid seal.

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