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IMPREGNATING APPARATUS

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Fig. 1

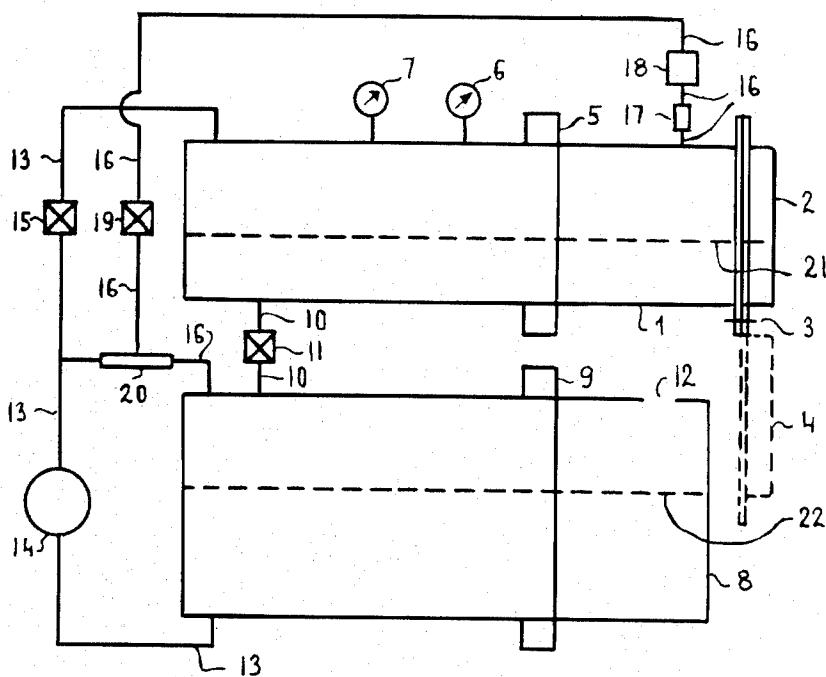


Fig. 2

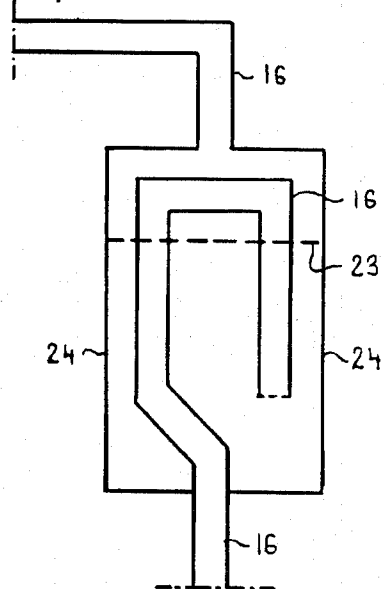
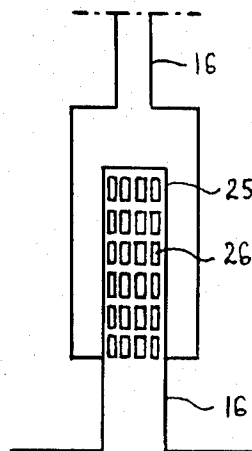


Fig. 3



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## IMPREGNATING APPARATUS

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1 Claim. (Cl. 118—50)

This invention relates to impregnating apparatus and, more specifically, to apparatus for impregnating materials such as wood, wallboard, rope and cordage with an impregnating liquor by vacuum pressure treatment.

One known form of impregnating apparatus comprises an impregnating cylinder for receiving the article to be impregnated, provided with an entry door which is closed and locked during air evacuation and subsequent impregnation, and communicating by way of pipes with a closed or open storage tank for storing the impregnating liquor during periods the apparatus is not in use. A pump is provided for reducing the pressure inside the impregnating cylinder prior to admission of the impregnating liquor.

Impregnation apparatus such as that outlined above is economic only for large consumers of impregnated wood as it has a large capacity and is expensive to install.

It is typically used for impregnating railway sleepers or telegraph poles and, because of its size, is not transportable and is seldom thermally insulated which makes winter operation of the plant outdoors unsatisfactory. The depth of penetration of the impregnating liquor is dependent on the dimensions of the article, the magnitude and duration of the vacuum to which the article is subjected prior to impregnation, and the type of impregnating pressure treatment to which the article is subsequently subjected.

An object of the present invention is the provision of impregnating apparatus suitable for treating, in economical manner, small articles such as are used in the field of cabinet making, joinery, carpentry and so forth.

Impregnating apparatus, in accordance with the present invention, comprises an impregnating vessel provided with a lockable door through which articles to be impregnated may be inserted into the vessel, a storage tank for storing impregnating liquor during periods the apparatus is not in use, piping for conveying impregnating liquor from the storage tank to fill the vessel and thus immerse contained articles as a first step in the impregnation process, a vacuum pump for reducing pressure in the vessel after it has been entirely filled with impregnating liquor so that air is sucked out of the immersed articles therein, and an ejector pump operable to increase the pressure in the vessel after a desired time to force the impregnating liquor into the article to be impregnated.

The advantage of such an arrangement of apparatus is that reduction of pressure within the vessel takes place whilst the vessel is completely filled with impregnating liquor. In consequence the only air requiring extracting is that from the article, and the reduction in pressure can take place quickly and a small but efficient vacuum pump may be used. Preferably the vacuum pump used is a liquid ejector jet pump which works on the venturi principle and is highly efficient.

Conveniently the pump used to increase the pressure within the vessel to force the impregnating liquor to penetrate into the article is a liquid pressure pump. However, atmospheric pressure may be used instead if preferred.

Where such a liquid pump is used it may also be arranged to provide the liquid for the liquid-jet pump (ejector). In this case the liquid comprises the impregnating liquor and is forced by the liquid pump through

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a closed liquid circuit which may contain the storage tank.

Apparatus in accordance with the invention may have small dimensions and impregnation therein can be conducted relatively quickly compared with conventional processes. Moreover, from the point of view of working economy a simpler apparatus requiring easier attendance is possible. By using an apparatus according to the invention a high vacuum between 95% and 100% is obtainable which ensures a large depth of penetration of the impregnating liquor into the wood. This, in turn, shortens the time of vacuum treatment and reduces the necessary pressure. The shortening in time of the process favourably influences working economy and, because less pressure is necessary to get the same penetration, the dimensions of the apparatus and thus its cost and weight may be reduced.

The invention will now be described in more detail, by way of example, with reference to the accompanying largely diagrammatic drawings, in which:

FIGURE 1 shows schematically an impregnating apparatus;

FIGURE 2 shows a liquid lock which is part of the apparatus of FIGURE 1; and

FIGURE 3 shows a part of a strainer device which forms part of the apparatus of FIGURE 1.

In FIGURE 1 an impregnating cylinder vessel 1 is provided with a charge opening 2 having a lockable door which can be swung around a pivot 3 into a lower open position 4. The impregnating cylinder 1 is provided with a liquid level meter 5 and a vacuum manometer 6 and also a pressure manometer 7. A storage tank 8 is arranged underneath the impregnating cylinder 1 and is provided with a liquid level meter 9 for indicating the level of impregnating liquor therein. The tank 8 communicates with the impregnating cylinder 1 by a pipe 10 which is provided with a valve 11. The tank 8 is provided with an upper opening 12 for the supply of impregnating liquid and the supply or evacuation of air. The storage tank 8 is further connected to the impregnating cylinder 1 by a pressure pipe line 13, in which a liquid pump 14 and a valve 15 are placed.

The impregnating cylinder 1 communicates further with the storage tank 8 by a vacuum pipe line 16, into which a strainer 17 and a liquid lock 18, a valve 19 as well as a liquid jet pump (ejector pump) 20 are placed. The broken lines 21 and 22 in FIGURE 1 indicate the level of the liquor in the impregnating cylinder 1 and the storage tank 8 respectively at a given time.

FIGURE 2 shows a detail of a liquid lock 18, in which 16a denotes part of the vacuum pipe line which is formed with a return bend so that its downwardly directed, open end is located beneath a liquid surface 23 (shown with dashed lines). The liquid lock is contained within a transparent tube 24.

FIGURE 3 is a detail of a strainer device 17, in which 16 is part of the vacuum pipe line, 25 the strainer itself and 26 a series of holes in the strainer.

At the beginning of the impregnating process impregnating liquor is held in the storage tank 8, the door of the charge opening 2 is opened and a quantity of wood or other material is put into the impregnating cylinder 1, whereafter the door is closed and locked. On the liquid level meter 9 of the storage tank the amount of impregnating liquor available is read off. Liquor is thereafter supplied to the impregnating cylinder 1 from the tank 8 and by continuously reading the liquid level meter 9 it can be decided what volume of liquor is needed in order to completely displace the air in cylinder 1. Since the volume of cylinder 1 is known the volume of wood to be impregnated can be calculated. The wood to be impregnated may have an irregular shape as is the case

with details of carpentry, joinery, woodwork and similar objects. After the end of the impregnating process it can be found out by again reading the liquid level meter 9 what quantity of liquor had been absorbed by the wood. By comparing this quantity with volume of the wood a measurement of the quality of the impregnating process can be obtained.

The impregnating process is carried out in such a way that the liquid pressure pump 14 is started after the wood had been put into the impregnating cylinder 1 and the door of the charge opening 2 had been closed. The valve 11 is closed and the valve 15 is opened. The displaced air in the cylinder 1 exhausts through the line 16, the tank 8 and the opening 12. A certain amount of liquid from the pump also passes through the liquid (ejector) jet pump 20 and line 16 and returns to the tank 8, but in view of the considerable difference of cross-sectional area between the two lines 13 and 16 this loss has no practical relevance.

When the cylinder 1 has been completely filled with impregnating liquor the valve 15 is closed so that the liquor from pump 14 flows through and operates the liquid jet pump 20 which operates to exhaust the small quantity of air remaining in the pipe lines 16. The reduction of pressure in cylinder 1 and line 16 causes the air enclosed in the wood article therein to be sucked out of the wood and to leave the cylinder 1 through the pipe line 16.

Liquid jet pumps are cheap and have a very high efficiency which lies between 95 and 100 percent vacuum. These high values of efficiency can also be reached by other pump constructions, but in exchange of this the costs do not remain in a reasonable proportion to the total price or value of the apparatus. On the other hand, the capacity of a liquid jet pump is limited if a good standard of efficiency is to be maintained. For this reason it is essential that the quantity of air to be displaced by the pump should be as small as possible. Such a minimum quantity of air is received in accordance with the invention by filling the impregnating cylinder 1 completely with impregnating liquor, after the wood had been placed into the cylinder 1. In this way the volume of air which is to be evacuated is reduced effectively to comprise only the quantity of air which can be extracted from the wood.

In order to be able to determine the moment when the evacuating period is to be finished, i.e. when no more air can be extracted from the wood in the cylinder 1, a liquid lock 18 is mounted in the line 16. As shown in FIGURE 2, the case of the liquid lock is made of transparent material, through which air bubbles leaving the lower opening of the return bend of the pipe 16 and passing through the liquid can be viewed. When air bubbling ceases the evacuating period is finished.

A strainer 17 shaped as an upright standing cylinder is placed into the pipe 16 in order to trap bark, carpenter's shavings and like material which otherwise would float up and be sucked into the pipe line 16 endangering the function of the liquid jet pump 20.

When no more additional air can be evacuated from the wood the period of evacuation is finished. The valve 19 is then closed and the valve 15 is opened. In this way a continuous stream of impregnating liquor is passed from pump 14 through the line 13 to the cylinder 1 under pressure. The pump is so dimensioned that a pressure of 4 to 6 kg./cm.<sup>2</sup> is received by the cylinder 1

(although part of the liquor from the pump 14 is returning to the tank 8 through the liquid jet pump 20). In this way both a cheaper construction as well as a simpler working method are effected. After the end of the pressure period the pump 14 is stopped, the valve 11 is opened and the remaining liquid in cylinder 1 is returned to the tank 8 through the pipe 10. The door of opening 2 is finally opened and the impregnated wood is removed.

The storage tank 8 is dimensioned to offer a volume which exceeds the volume of the impregnating cylinder 1 by about 200 litres. The impregnating liquor is furnished to the apparatus or it is mixed for use in it in standard barrels (such as used for petrol or oil) which each have a volume of about 190 litres. This difference of volume makes it possible to furnish liquor to the apparatus in unopened standard units, for instance in standard barrels. This is a fact of economic importance for the working of the apparatus.

The strainer for trapping the bark is shaped as an upright standing cylinder connected to the cylinder 1. Bark and the like can drop down into the impregnating cylinder after the liquid level therein has dropped. The strainer is thus self-cleaning at the end of each impregnation process.

What I claim is:

Apparatus for impregnating wood articles with a liquid which comprises a liquid storage tank for storing an impregnating liquid, an impregnating vessel for receiving articles therein to be impregnated with a liquid, liquid supply piping connected to the liquid storage tank and to the upper portion of the impregnating vessel for conveying impregnating liquid from said storage tank to completely fill the impregnating vessel and completely immerse articles contained therein, a liquid pressure pump connected to said liquid supply piping, a liquid supply control valve in said liquid supply piping located at a point between said liquid pressure pump and the upper portion of the impregnating vessel, a drain pipe connecting the bottom of the impregnating vessel and the liquid storage tank, a control valve in said drain pipe, a liquid ejector jet pump having liquid ports and a vacuum port, the vacuum port being connected to the uppermost portion of the impregnating vessel by vacuum piping, said vacuum piping being connected to a vacuum control valve connected to said vacuum piping, and the liquid ports of said jet pump being connected to the upper portion of said storage tank and to the said liquid supply piping at a point intermediate the liquid pressure pump and the said liquid supply control valve a strainer for solid materials and a liquid lock made of transparent material both connected to said vacuum piping adjacent the upper portion of said impregnating vessel.

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