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O. F. WYSS ET AL
 APPARATUS FOR IMPREGNATING POURABLE MATERIAL SUCH AS
 CHIPS, SHAVINGS, AND FIBROUS MATERIAL
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2,601,355

Fig. 1

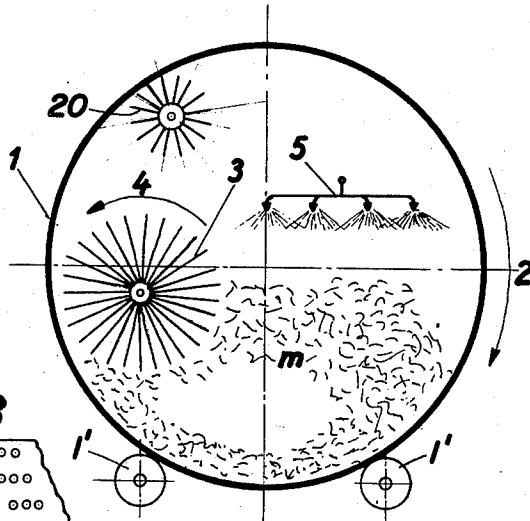


Fig. 3

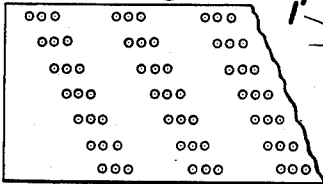


Fig. 2

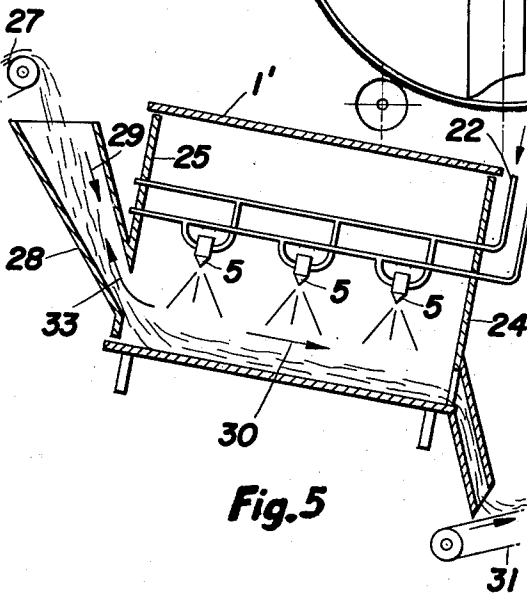
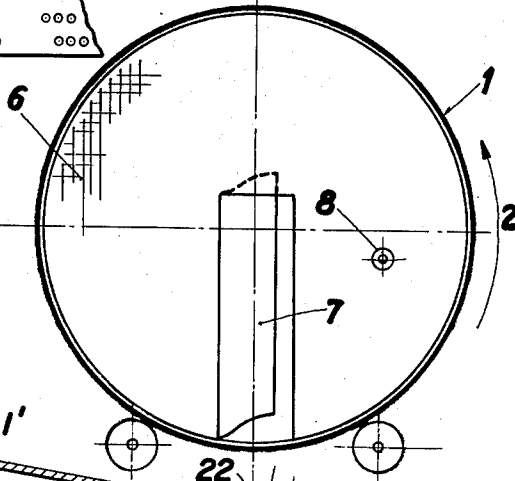


Fig. 5

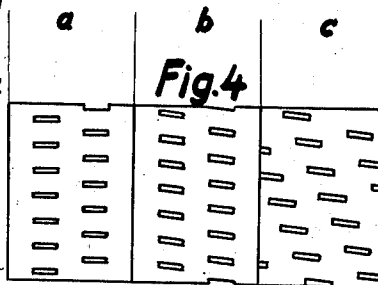


Fig. 4

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UNITED STATES PATENT OFFICE

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APPARATUS FOR IMPREGNATING POUR-
ABLE MATERIAL SUCH AS CHIPS, SHAV-
INGS, AND FIBROUS MATERIALOswald Fidel Wyss, Zurich, Switzerland, and
Hans Peter, Strasbourg, France; said Peter
assignor to said WyssApplication October 10, 1950, Serial No. 189,311
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3 Claims. (Cl. 118—56)

1

The invention relates to apparatus for im-
pregnating pourable material such as chips,
shavings and fibers by sprayable material applied
from nozzles.

In cases where a pourable material is to be
wetted or impregnated with a high degree of
uniformity yet with a minimum amount of an
impregnating sprayable agent such as liquid, dis-
solved or emulsified materials or materials other-
wise finely distributed in liquid, it is usually ad-
vantageous to apply the impregnating agents by
means of one or several nozzles. The spraying
of the impregnating agent from these nozzles
is usually carried out in sealed apparatus, con-
tainers or chambers in order to avoid the escape
of unused nozzle mists or vapors of the im-
pregnating liquid. The material to be impreg-
nated is repeatedly subjected to tumbling, mix-
ing and distributing in order to expose it time
and again to the spray for securing a uniform
wetting of the individual particles from all sides.
Some materials to be wetted are of such a char-
acter that care must be taken to prevent their
texture and/or shape from being disturbed or
otherwise detrimentally affected by the process.
Therefore, such materials, usually in the form of
shavings or fibers have been impregnated while
they are slowly descending in the interior of a
well or tower. This method has been used for
instance, for impregnating materials that are
capable of being deposited in loose layers or that,
due to their low specific weight or their particu-
lar shape, will only slowly descend in an air
space or will flutter or twirl when descending.
When spraying such slowly descending materials,
the spray nozzles are preferably applied from the
side of the descending path. While for such ma-
terials many of the otherwise customary mix-
ing, masticating and tumbling devices have been
found to be of little advantage and, due to the
action of their mixing, kneading and tumbling
members, may even have a detrimental effect,
the spraying of the downwardly fluttering ma-
terial from lateral nozzles results in superior
products and has the advantage that the twirl-
ing individual particles are wetted from all sides
within a mostly well distributed flow of ma-
terial.

This method, however, is less successful with
fast descending materials and also requires a
relatively large expenditure in space and equip-
ment. Although it has been attempted to re-
tard the descent of the material by agitating
the air, such methods require intricate devices,
and the air blown into the processing space for

2

agitation causes air to escape at other spots of
the apparatus so that additional means are
needed to liberate the escaped air from spray
mists and other carried-off substances. In most
cases the necessary wells, towers or the like de-
vices have a considerable height, and it is often
necessary to repeatedly pass the material
through the tower or well before it is sufficient-
ly impregnated. Besides, the side walls of the
towers are also wetted by the sprayed liquids,
and these liquids gradually run down along the
walls and stick to them so that sometimes rather
complicated cleaning accessories are required.

A similar impregnating process has also been
carried out in horizontally arranged rotating
drums in which the tumbling or rolling material
is supposed to remain more or less continuously
within the effective range of the spray cones of
one or several nozzles. Such devices require
considerably less space than tower type appar-
atus and permit the processing of material which
would drop too fast to the bottom of a tower.
The horizontal type equipment also affords a
moderate, sometimes sufficient cleaning of the
interior drum walls due to the friction of the
rotating material. On the other hand, the nozzle
spray in such apparatus impinges upon a much
more densely distributed or even a packed heap
of material as compared with the downwardly
fluttering material processed in tower installa-
tions. Consequently, larger quantities of spray-
ing liquid are required for wetting the material
or the wetting may remain incomplete. Especial-
ly with material not fully dry or material which
has already taken up a certain quantity of ma-
terial, it may easily happen that the material
will gather in heaps, bunches or lumps, this be-
ing especially the case with material of the
readily interweaving or feltable type which, just
on account of its interweaving or felting tenden-
cy, is especially desired in some industries such
as the production of sheets and other solid bodies
of chips or fibrous material by a more or less
dry fabricating method. Such lumps of material
occurring in horizontal drums hardly admit
wetting liquids into their interior so that the
resulting product is non-uniformly impregnated
even if the lumps are subsequently subdivided.

It is an object of the present invention to pro-
vide apparatus having the advantages of the
known tower and drum type impregnating ap-
paratus while avoiding their above-mentioned
disadvantages.

According to the invention, an impregnating
apparatus for the above-mentioned purposes has

3

a horizontal drum for receiving the material to be impregnated. The drum has a rotating cylinder wall and normally stationary end walls. Disposed within the drum is a rotating rake whose direction of rotation is opposed to that of the cylinder wall and whose rotating speed is considerably faster than that of the cylinder wall. The rake is adjacent to the upwardly moving portion of the cylinder wall. Also disposed within the drum are nozzles whose spray cone covers the material thrown upwardly by the rotating rake.

According to another feature of the invention, one or both of the stationary end walls of the horizontal drum accommodates the means for journalling the rotating rake and also the holding means for the nozzles or sets of nozzles. According to a further feature, particularly for continuously operating devices, one of the end walls of the receiving drum has an opening for the introduction of the material to be impregnated while the other end wall has an opening for the discharge of the impregnated material, one or both of the end walls being preferably equipped with holding or supporting means for auxiliary accessories if needed. According to another feature of the invention, the rotary speed and the relative height of the rake are adjustable.

The foregoing and more specific objects and features of the invention will be apparent from the following description in conjunction with the embodiments exemplified by the drawing, in which

Figure 1 is a schematic front view on the intake side of a drum type apparatus according to the invention, the front end wall being omitted to show the interior of the drum,

Figure 2 is a schematic rear view of the same apparatus, i. e. a view from the discharge side including the appertaining rear end wall;

Figures 3 and 4 show in peripherally developed form different embodiments of a rake device pertaining to the apparatus.

The apparatus according to Figures 1 and 2 is designed for continuous operation. The apparatus has a horizontal drum whose cylindrical wall is denoted by 1. This wall is supported by rollers 1' by means of which it is rotated in the direction of the arrow 2 when the apparatus is in operation. A rake device exemplified by a radial type wire brush 3 is disposed near the upwardly moving portion of the cylindrical wall and rotates in the direction of the arrow 4. The material is charged into the drum from the front side of Figure 1 and passes longitudinally through the drum until it is discharged at the rear end shown in Figure 2. During this passage the material is entrained by the rotating cylinder wall of the drum, and when moving upwardly is caught by the rake 3 and then flung away in opposition to the peripheral drum movement. Consequently, the material is highly agitated and passes repeatedly, in a good distribution through the effective range of a group of nozzles 5 before the material again drops to the peripheral cylinder wall to be entrained toward the rake for a repetition of the procedure. At the same time, the dropping chip or fibrous material protects the drum from collecting dirt. The spray direction of the material caught by the rake drum can be determined or controlled by deflector sheets or baffles mounted in the vicinity of the rake.

As apparent from Figure 2, the rear end wall 6 of the drum, which like the front wall is sealed against the rotating cylinder wall by suitable

4

sealing means, has a discharge opening bordered by an inwardly directed collector baffle 7. During the continuous operation of the apparatus the baffle 7 collects and guides the finished impregnated material out of the discharge opening. The bearing for the rake drum 3, shown in Figure 2 at 8, is mounted on the rear end wall 6.

If, for instance when processing a very sticky impregnating substance, a continuous cleaning of the drum wall is desired, a scraper or the like cleaning device may be provided preferably above the rake and rotating in the same rotary sense as the rake while wiping over the drum wall. This rotating cleaning device, as shown at 20 in Fig. 1, may consist of a brush roll or may have squeegee or scraper blades or the like and is preferably designed to be readily exchangeable. The bearings of such a rotating cleaning device are also mounted on the axial end walls of the drum. It is also readily possible to attach the nozzle or nozzle sets or to design the appertaining holding devices at the axial end walls of the apparatus in such a manner that the nozzles or nozzle sets can readily be exchanged, which is of advantage especially for processing impregnating materials of pronounced stickiness. The nozzles may also be individually and exchangeably secured to the appertaining supply pipes.

As mentioned, apparatus according to the invention are well suited for continuous operation over long periods of time. For such an operation the material to be impregnated, arriving for instance, from a conveyor band, is continuously admitted through an opening in the axial front wall of the drum or is dropped through the opening, so that the treated material will continuously emerge from the opening in the axial rear wall. In order to obtain a gradual and continuous travel of the material along the cylinder wall and along the axis of the rotary rake, a slight inclination of the drum toward the horizontal is preferable so that the rear wall of the drum is lower than the front wall. In addition, some accessory means and simplifications described in the following are favorably applicable.

The gradual and continuous travel of the material to be impregnated along the drum, i. e. in the axial direction of the rake drum can be improved, for instance, by having the active member of the rake, or series or combinations of these members disposed in a spiral or helical arrangement on the core or drum portion of the rake. An embodiment of this kind is schematically represented in Figure 3 showing a peripheral development of the cylindric body that forms the core or hub portion of the rake. As shown in Figure 3, the rake core is equipped with a multitude of series of prongs, each series comprising three individual aligned prongs or wires. The prong series are disposed in a helical arrangement.

The individual active members of the rake also may be designed as small ledges, beater arms or spokes of smaller or larger width in order to increase the shovel action of the rake device. Such ledge shaped shovelling members may also be arranged on the rake drum or core in a spiral or helical arrangement. For instance, in order to obtain a feed movement of the material parallel to the axial direction of the drum and in addition to the main feed movement, the just-mentioned ledge type spokes or beater arms of larger or smaller width are preferably skewed relative to the core of the rake. Slanted or

skewed shovelling members may also be mounted along the rake core in a spiral type arrangement in order to increase the feed movement of the material along the rake. Several arrangements of this type are shown in Figure 4 which also represents the peripheral drum or core surface of the rake in developed form along the plane of illustration. The section *a* of Figure 4 shows a normal arrangement of such ledges or shovelling members, i. e. these members are neither slanted nor helically arranged. Section *b* of Figure 4 shows a non-helical arrangement of similar shovelling members which, however, are slightly skewed relative to the rake axis. Section *c* of Figure 4 shows ledge members which are skewed and also arranged on a helix. The described arrangement of the rake members on the rake shaft or core body can be used alone or in conjunction with an inclined positioning of the drum relative to the horizontal. The time needed for impregnating the individual particles of the material in the drum depends upon, and can be determined from, the type or pitch of the helical arrangement of prongs, spines, wires and the like of the rake, the prong density in the helical arrangement, the degree of skew of the rake members and in some cases also the width of these ledge or spoke shaped members, also the length of the drum at a given cross section and the possibly applied angle of inclination toward the horizontal, and the like criteria relating, for instance, to the particular design and arrangement of the rake members. These various conditions are preferably chosen or adjusted in accordance with the particularities of the material to be treated in each case.

In conjunction with all above-mentioned embodiments of apparatus according to the invention, and referring especially to apparatus for continuous operation, the discharge of the air supplied to the nozzles for spraying purposes can be combined with the introduction of the material to be impregnated preferably so that the discharge of this air occurs in a counterflow to the supply of material. This has the advantage that any residual mists or remainders of impregnating agent that may still be contained in the discharged air are more or less retained by the material to be impregnated and thus are salvaged with the effect of not only cleaning the air to be discharged but also preimpregnating the material to be treated before it reaches the interior proper or nozzle zone of the drum.

We claim:

1. Apparatus for impregnating pourable material such as chips, shavings or fibrous material, comprising a substantially horizontal drum for receiving the material to be impregnated, said drum having a revolvable cylinder wall and normally stationary axial end walls, a rotary rake device of smaller diameter and higher rotary speed than said drum, said rake being disposed within said drum adjacent to the upwardly moving portion of said cylinder wall and having a direction of rotation opposed to that of said drum for throwing the material upwardly toward the downwardly moving wall portion, and means for applying to the material a mist of impregnating agent, said means comprising spray nozzles and having an air

supply conduit and a supply conduit for impregnating agent connected to said nozzles, said nozzles being disposed within said drum laterally above the axis of said rake device and having a spray zone covering the zone in which the material is thrown upwardly by said rake device.

2. Apparatus for impregnating pourable material such as chips, shavings or fibrous material, comprising a substantially horizontal drum for receiving the material to be impregnated, said drum having a revolvable cylinder wall and normally stationary axial end walls, a rotary rake device of smaller diameter and higher rotary speed than said drum, said rake being disposed within said drum adjacent to the upwardly moving portion of said cylinder wall and having a direction of rotation opposed to that of said drum for throwing the material upwardly toward the downwardly moving wall portion, spray nozzle means for applying a mist of impregnating agent to the material, said nozzle means being disposed within said drum and having a spray zone covering the zone in which the material is thrown upwardly by said rake device, said drum being slightly inclined relative to the horizontal and having a charge opening at its higher end wall and a discharge opening at its lower end wall, and said rake device having helically arranged rake members to impart to the material a feed movement toward said discharge opening.

3. Apparatus for impregnating pourable material such as chips, shavings or fibrous material, comprising a substantially horizontal drum for receiving the material to be impregnated, said drum having a revolvable cylinder wall and normally stationary axial end walls, a rotary rake device of smaller diameter and higher rotary speed than said drum, said rake being disposed within said drum adjacent to the upwardly moving portion of said cylinder wall and having a direction of rotation opposed to that of said drum for throwing the material upwardly toward the downwardly moving wall portion, spray nozzle means for applying a mist of impregnating agent to the material, said nozzle means being disposed within said drum and having a spray zone covering the zone in which the material is thrown upwardly by said rake device, a spraying air conduit connected with said nozzle means, and feed means for applying the material to be impregnated, said feed means having a supply conduit joined with one of said axial end walls and traversing said one end wall so as to permit waste air from said nozzle means to escape through said supply conduit in counterflow to the material.

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