

May 14, 1963

F. REITERER
CARDING APPARATUS

3,089,200

Filed Nov. 14, 1958

4 Sheets-Sheet 1

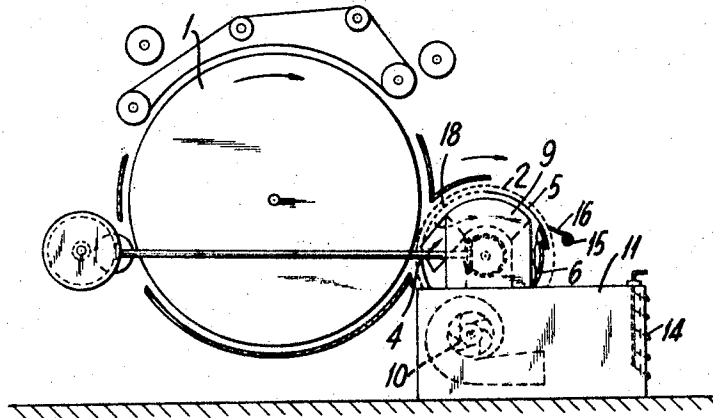


FIG. 1

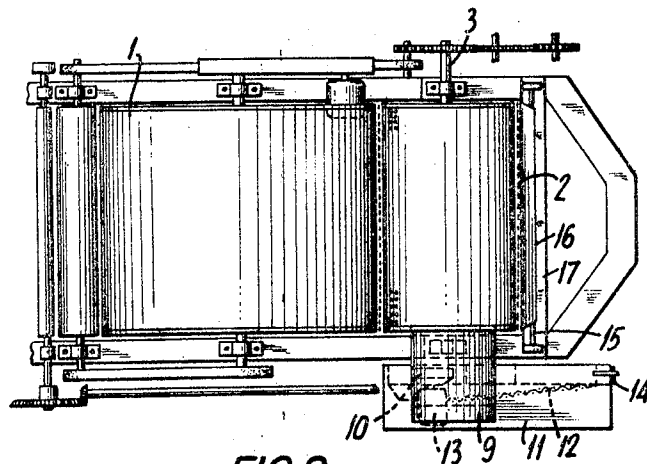


FIG. 2

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4 Sheets-Sheet 2

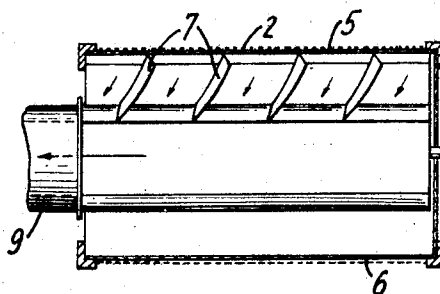


FIG. 3

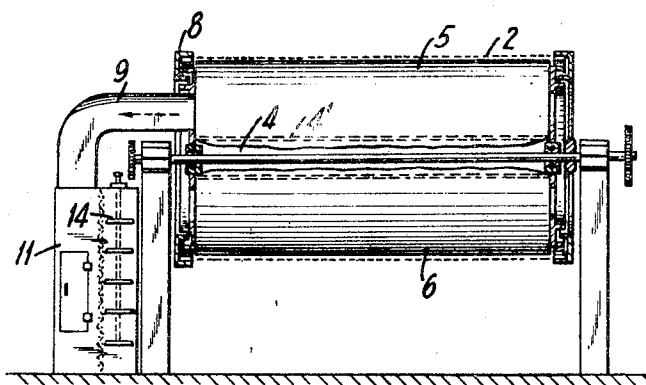


FIG. 4

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4 Sheets-Sheet 3

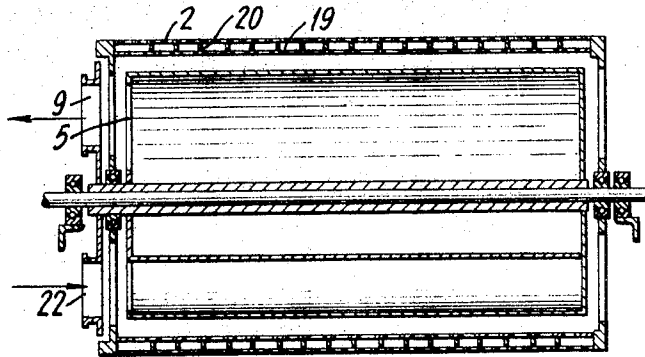


FIG. 5

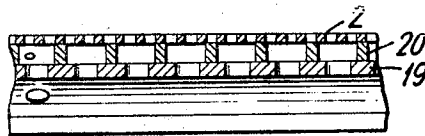


FIG. 6

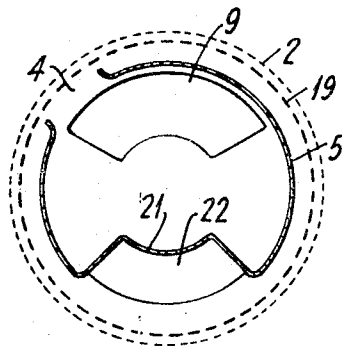


FIG. 7

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4 Sheets-Sheet 4

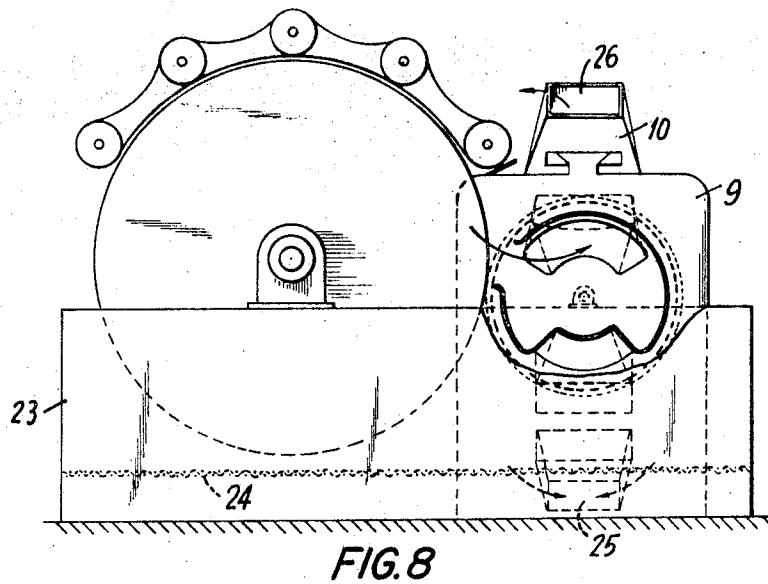


FIG. 8

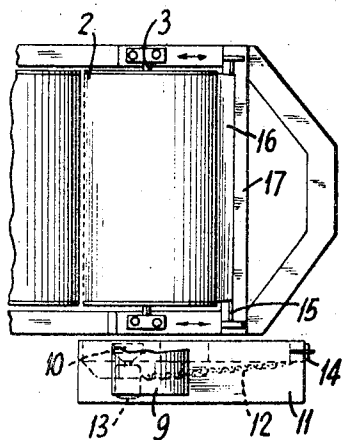


FIG. 9

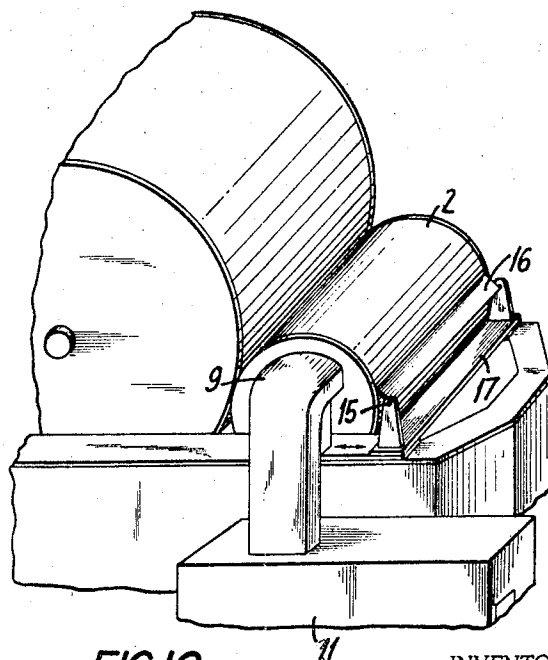


FIG. 10

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3,089,200

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12 Claims. (Cl. 19—106)

The present invention has for its object an improve-
ment in carding apparatus intended for treating fibres of
all kinds and more particularly textile fibres.

Carding apparatus usually comprises a first cylinder,
known as the "main cylinder" or "swift," parallel to which
there rotates a second cylinder, known as the "doffer,"
which is of smaller diameter, the peripheries of which
cylinders are provided with projecting needles or pins.
The two cylinders rotate on their axes in opposite direc-
tions at speeds such that in the working zone, where they
are substantially tangential to one another, their linear
speeds are different. The fibres carried along by the swift
are thus detached therefrom by the needles of the doffer
and condensed or collected on the latter by reason of the
difference in the linear speeds of the two cylinders.

This arrangement has many drawbacks. In the first
place, the fibres, which are substantially parallel to each
other on the periphery of the swift, are turned round or
back and their parallelism is spoiled and this makes the
drawing operations following the carding more difficult.
Moreover, the fibres are subjected to rubbing, which may
give rise to the formation of neps and an accumulation
of dust and short fibres.

Finally, since the peripheral movements of the two
cylinders, in the working zone in which they are opposite
one another, take place in the same direction and at
different speeds, a reduced air pressure is produced above
the said zone and, on the other hand, an increased pressure
below the said zone. This increased pressure has the
effect of entraining the waste and of accumulating this, in
the form of wads, in the angle formed by the casings of the
two cylinders.

By reason of these various drawbacks, carding appa-
ratus as known at present has only a low efficiency, and
this makes a large number of carding apparatus necessary
for a given piece of work. The result is high cost of
installation and the occupation of a large amount of space.

The present invention has for its object to provide card-
ing apparatus which does not suffer from these disad-
vantages.

The apparatus according to the invention is character-
ised by the fact that a pneumatic doffer is used instead of
the usual mechanical doffer. The doffer comprises a
hollow doffer cylinder having a perforated peripheral
wall and the interior space of which is kept under reduced
pressure. Preferably, inside this cylinder and concen-
trically therewith there is disposed a fixed hollow cylind-
rical partition having, on the side facing the swift, a
longitudinal aperture preferably extending over its entire
length and forming a suction opening. The space inside
the perforated cylinder is connected, at at least one of its
two ends, through the intermediary of air-tight connecting
means, to a suction fan or extractor. Preferably, the
inner wall of the fixed internal cylindrical partition carries
deflecting vanes, the function of which is to equalize the
reduced pressure over the entire length of the element.

The accompanying drawings show by way of example
one embodiment of carding apparatus according to the
invention. In these drawings:

FIGURE 1 is a side elevation;

FIGURE 2 is a plan view, of the whole of the installa-
tion;

FIGURE 3 is a sectional view of a card having a fixed

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internal cylindrical enclosure or chamber provided with
vanes;

FIGURE 4 shows the arrangement providing air-tight-
ness and for connecting the said chamber to the fan;

FIGURES 5 and 6 are sectional views of a doffer
cylinder having double perforated walls;

FIGURE 7 shows an internal chamber divided into
a suction zone and a blowing zone;

FIGURE 8 shows an arrangement for cleaning the
machine by pressure reduction and blowing; and finally
FIGURES 9 and 10 show the device for detaching or
doffing the web.

In these figures, 1 designates the main cylinder or swift,
on to the periphery of which the fibres to be carded are
brought by any known means, and 2 designates the perfo-
rated hollow cylinder which replaces the doffer provided
with needles and which rotates about a shaft 3. Inside the
cylinder 2 there is disposed, as previously stated, an
internal cylindrical partition having, opposite the swift 1,
a longitudinal aperture 4. Preferably, the width of this
aperture is adjustable by any known means, for example
by forming the cylindrical partition by means of two
elements 5 and 6 which can overlap to a greater or lesser
extent for the purpose of widening or narrowing the
aperture 4 and 4' (FIGURE 1 and FIGURE 4). As men-
tioned, the inner wall of the elements 5, 6 is preferably
provided with deflecting vanes such as 7 (FIGURE 3).
The element 5 is provided with a grid 18 over a certain
area for the purpose of holding the web lightly against
the perforated cylinder 2 until it reaches its point of
detachment. FIGURE 3 is a detail view showing an
internal partition provided with the said vanes.

At one of its lateral ends the cylinder 2 is open and
connected, through the intermediary of an annular seal 8
(FIGURE 4) which permits the rotation of the cylinder
while ensuring air-tightness, to a connecting piece 9 con-
nected to a suction fan 10. The fan 10 blows the sucked-
in air into a box 11 provided with a filter 12 and in which
the waste is collected, which latter can thus be recovered
(FIGURE 2).

According to an improved and advantageous form of
the doffer cylinder, which is shown in FIGURES 5 and
6, this cylinder can comprise a double wall, namely the
outer wall 2 containing fine perforations and an inner
wall 19 disposed parallel to and at a certain distance
from the first wall and containing a smaller number of
perforations of greater area. To this end, the doffer
cylinder may consist of two concentric cylinders disposed
close to one another—the cylinder with fine perforations
and the cylinder with large perforations—which are con-
nected one to the other by means of a certain number
of annular partitions 20 extending at right angles to the
axis of the said cylinders. In this way there is formed
between the two cylinders a certain number of compart-
ments each of which preferably comprises only a single
row of perforations in the inner cylinder.

This arrangement ensures more regular suction and
better utilization of the perforated surface of the outer
cylinder. Moreover, the fibres detached from the main
cylinder or swift are no longer so detached in bulk, but
in the form of strips or bands corresponding to each of
the compartments of the cylinders and this ensures im-
proved homogeneity and improved parallelism of the
fibres forming the web. Furthermore, the air set in mo-
tion is better guided, which results in greater regularity
of the reduced pressure.

According to another improvement shown in FIGURE
7, the delivery of the fan securing the suction in the
doffer is utilized for cleaning the frame of the ma-
chine and/or the actual surface of the outer cylinder of
the doffer by blowing.

To this end, the inner part of the doffer, that is to say

the fixed cylinder connected to the fan, can be divided by a longitudinal partition 21 into two parts, one of which is connected to the fan by the duct 9 so as to be under reduced pressure, while the other is connected to the fan by a second duct 22 so as to be under increased pressure. It is clear, therefore, that after the surface of the doffer has sucked up the fibres as it passes in front of the aperture 4 it will be cleaned by blowing when, during the rotation of the doffer, the surface thereof passes into the zone which is under increased pressure.

According to yet another improvement, which is shown in FIGURE 8, the frame 23 of the machine which supports the swift 1 and the pneumatic doffer is provided in its lower portion with a double bottom 24 made of perforated sheet metal in which the waste is deposited and which is placed in communication with the suction side of the chamber of the fan 10 through a duct 25. Moreover, the delivery opening 26 of this chamber can be disposed so as to ensure the cleaning of the various parts of the machine, and in particular of the swift 1, by blowing. The arrows show the direction of circulation of the air.

Owing to this arrangement, the waste coming from the various cleaning means is not deposited in a heap in the form of a pyramid, but is spread in a layer over the whole of the area of the double bottom. The result is the possibility of accumulating a much larger quantity of waste in a box of given volume, which causes a saving in handling. Finally, in consequence of the reduced pressure prevailing in the lower part of the card, the dust no longer has a tendency to spread outwards, but on the contrary is sucked towards the double bottom and this purifies the atmosphere and reduces the frequency of cleaning operations, since the essential parts of the card are clogged to a lesser extent.

The detachment of the web from the doffer may be accomplished by many suitable means such as a conventional detaching device 16.

Moreover, the assembly consisting of the doffer and the detaching or doffing device is preferably mounted on an adjustable frame 17, which enables the distance between the shaft of the doffer 2 and the shaft of the swift 1 to be varied.

Regulation of the suction can also be obtained by changing the position of the damper or regulator system 14. The fan is preferably driven by a motor 13, but can be driven, if necessary by means of a transmission connected to the driving pulley of the swift.

The apparatus according to the invention eliminates turning round or back of the fibres, because after the suction has been exerted on the latter they are retained on the surface of the perforated cylinder by the reduced pressure prevailing inside the suction opening. The elimination of the rubbing of the fibres reduces the formation of dust and waste and ensures improved parallelism of the fibres on the surface of the perforated cylinder, since these fibres do not change their position again after they have been caught. The maintenance of this parallelism assists in simplifying the drawing processes which follow the carding and it permits of obtaining more regular rovings and slivers.

Furthermore, since the detachment of the fibres from the swift is effected by suction, there is no longer any difference of pressure and consequently no more tendency to entrainment and accumulation of the fibres in the angle of the casing below the said zone.

Moreover, the apparatus according to the invention ensures additional and effective cleaning of the fibres, since the dust in suspension, and also any small impurities, are evacuated through the openings in the perforated cylinder. This dust-removing action improves the quality of the finished product and reduces the cleaning time, while avoiding the dispersal of the dust in the surrounding air.

Finally, the suction which takes place through the ori-

fice of the cylinder is more intense in the places where the deposit of fibres is lighter. Thus, a self-regulation effect in the drawing of the fibres on to the cylinder is obtained and this enables a web to be produced which is more regular than that obtained by the known methods.

The carding is also more effective, because the fibres are sucked towards the tips of the needles of the clothing of the swift, that is to say to the place where the effectiveness of the apparatus is greatest, instead of remaining accumulated at the base of the needles. The frequency with which the cylinders are cleared is consequently considerably reduced.

For this reason, and also by reason of the elimination of the rubbing of the fibres, the apparatus according to the invention enables the output of the card to be considerably increased. This increase in output of each card enables the number of cards required for a given piece of work to be reduced, which results in a very considerable saving of installation costs and space. The over-all efficiency is considerably increased.

I claim:

1. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought, and a doffer cylinder of smaller diameter than the first cylinder and rotating parallel to the first cylinder, said doffer cylinder having an external cylindrical wall having a large number of fine perforations and a concentric inner wall disposed coaxially with the first wall and having a smaller number of perforations of greater area, and a plurality of arcuately shaped partitions extending between said walls and defining therewith a plurality of arcuate compartments, and means for maintaining at a reduced pressure an interior space along at least a portion of said doffer cylinder facing said main cylinder whereby fibers may be held upon said doffer cylinder by an air stream passing through said compartments to said reduced pressure space.

2. Carding apparatus according to claim 1, wherein said partitions each have an annular configuration and define annular compartments between said walls.

3. Carding apparatus according to claim 2, in which the annular compartments bounded by two adjacent partitions each comprises a single row of perforations of the inner wall.

4. Carding apparatus according to claim 1, which comprises a fixed, hollow cylinder disposed concentrically with and inside the perforated rotating doffer cylinder and having throughout its length, on the side facing said main cylinder at least one aperture forming a suction opening.

5. Carding apparatus according to claim 4, in which the fixed cylinder is divided by a longitudinal partition into two compartments, one of which is connected to the suction side of the fan and to the suction aperture opposite the swift, while the other is connected to the delivery or pressure side of the fan and is exposed to said doffer cylinder for the purpose of cleaning the surface of the doffer cylinder during the rotation of the latter.

6. Carding apparatus according to claim 4, in which the fixed cylinder has an inner wall provided with deflecting vanes for the purpose of equalizing the reduced pressure inside the said cylinder along said aperture.

7. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought and a doffer cylinder of smaller diameter than said first cylinder and rotating parallel to the first cylinder, said doffer cylinder being hollow and having a peripheral cylindrical wall comprising a series of perforations, and means for keeping the interior space of said doffer cylinder under reduced pressure to hold fibers against said doffer cylinder by air flow therethrough, said last-mentioned means including a fan for providing suction to secure said reduced pressure and having means arranged on a high

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pressure side of said fan for cleaning various parts of the carding apparatus by air delivered by the fan.

8. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought and a doffer cylinder of smaller diameter than said first cylinder and rotating parallel to the first cylinder, said doffer cylinder being hollow and having a peripheral cylindrical wall comprising a series of perforations, and means for keeping the interior space of said doffer cylinder under reduced pressure to hold fibers against said doffer cylinder by air flow therethrough, said last-mentioned means comprising a fan for withdrawing air from said doffer cylinder, said carding apparatus including a frame having in its lower portion a double bottom including a perforated wall exposed to the apparatus and defining a chamber, and means for placing said chamber in communication with said fan so that the fan maintains a reduced pressure in said chamber to retain waste material from said apparatus on said last-mentioned perforate wall.

9. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought, a doffer cylinder of smaller diameter than the first cylinder and arranged to rotate parallel to the first cylinder and adjacent thereto, said doffer cylinder having a perforate peripheral wall, and means for keeping an interior space of said doffer cylinder under reduced pressure to draw air through the perforations of said perforated wall for holding fibers thereagainst, said last-mentioned means including a fixed hollow structure disposed within the perforated rotating doffer cylinder and having throughout its length on the side facing said first cylinder at least one aperture forming a suction opening, said fixed structure being divided by a longitudinal partition into two compartments, said last-mentioned means further including a fan and means for connecting the suction side of the fan to one of said compartments and the delivery side of the fan to the other compartment, said one compartment being also connected to said suction opening, and said other compartment being exposed to said doffer cylinder for the purpose of cleaning the surface of the latter during its rotation.

10. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought and a doffer cylinder of smaller diameter than said first cylinder and rotating parallel to the first cylinder, said doffer cylinder being hollow and having a peripheral cylindrical wall provided with a series of perforations, and means for keeping at least a portion of the interior space of said doffer cylinder under reduced pressure to hold fibers against said doffer cylinder by air flow therethrough, said last-mentioned means comprising a fan for withdrawing

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air from said doffer cylinder, said carding apparatus including a frame having in its lower portion a double bottom including a perforated wall exposed to the apparatus and defining a chamber, and means for placing said chamber in communication with said fan so that the fan maintains a reduced pressure in said chamber to retain waste material from said apparatus on said last-mentioned perforated wall.

11. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought, and a doffer cylinder of smaller diameter than the first cylinder and rotating parallel to the first cylinder, said doffer cylinder having an external cylindrical wall and a concentric inner wall disposed coaxially with the first wall, said external cylindrical wall and concentric inner wall each having perforations therein, a plurality of annular partitions extending between said walls and defining therewith a plurality of annular compartments, and means for maintaining at a reduced pressure an interior space along at least a portion of said doffer cylinder facing said main cylinder whereby fibers may be held upon said doffer cylinder by an air stream passing through said compartments to said reduced pressure space.

12. Carding apparatus for fibers of all kinds, comprising a main first cylinder for use as a swift onto the periphery of which the fibers to be treated are brought, and a doffer cylinder of smaller diameter than the first cylinder and rotating parallel to the first cylinder, said doffer cylinder having an external cylindrical wall having a large number of perforations therein and a concentric inner wall disposed coaxially with the first wall and having a lesser number of perforations therein, a plurality of annular partitions extending between said walls and defining therewith a plurality of spaced annular compartments, and means for maintaining at a reduced pressure an interior space along at least a portion of said doffer cylinder facing said main cylinder whereby fibers may be held upon said doffer cylinder by an air stream passing through said compartment to said reduced pressure space.

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