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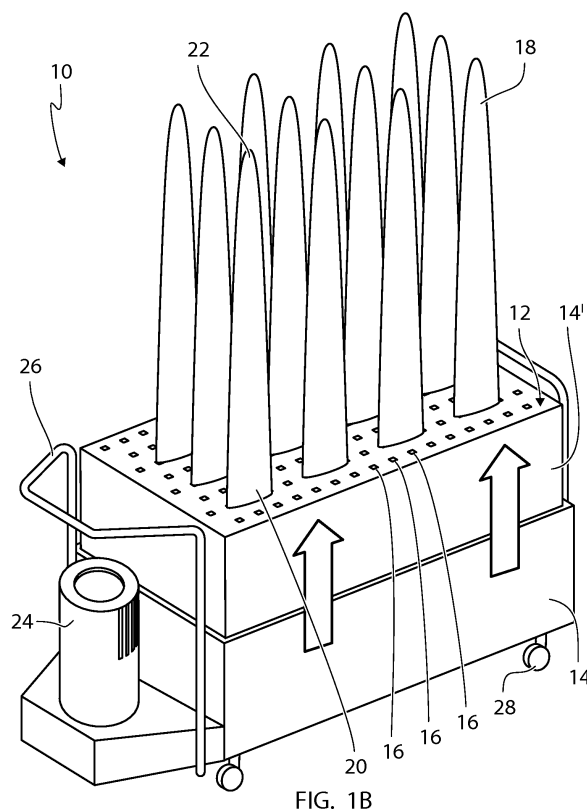
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(54) **DRYING UNIT FOR ACCOMMODATING A PLURALITY OF ELONGATED HOLLOW PELT BOARDS**

(57) A drying unit for accommodating a plurality of elongated hollow pelt boards which defines a top plate, a bottom plate, a gas inlet and a sidewall. Each of the elongated hollow pelt boards has a pelt board top, a pelt board bottom and a connecting element at the pelt board bottom. The top plate has a number of apertures, each of the apertures being adapted for accommodating the connecting element, and the bottom plate is parallel to and spaced apart from the top plate. The gas inlet serves to receive a stream of gas, preferably air, and the sidewall interconnects the top plate and the bottom plate in a fluid-tight manner for establishing an inner space between the top plate, the bottom plate, the gas inlet and the sidewall. The drying unit further comprises a flow distributor disposed within the inner space between the gas inlet and the top plate. The invention further relates to a method of drying a pelt by employing the drying unit.



Description

[0001] The present invention relates to a drying unit for accommodating a plurality of elongated hollow pelt boards, and associated methods of drying a pelt by providing a drying unit.

Background

[0002] Pelt boards and drying units are used in the pelt industry in the process of tanning pelts. The pelts, such as pelts from smaller mammals, preferably minks, foxes or the like, are stretched onto a pelt board for drying. Historically such pelt boards were made from solid wood, however, recently hollow pelt boards made of plastic have been used. Such hollow pelt boards are often made from two elongated half parts which together form a convex surface about a central axis. The half parts may be movable relative to one another for allowing the pelt board to collapse in order to simplify the removal of the pelts after drying. The pelt boards typically have a slightly conical shape from a bottom end to a top end. The pelts are stretched onto the pelt boards such that the cranium end of the pelt is located at the top end of the pelt board and the tail end of the pelt is located at the bottom end of the pelt board.

[0003] The pelt boards are often used together with a layer of fat absorbing material such as paper for absorbing fat from the pelt. The moist of the pelt is however removed using a drying unit for drying the pelts by means of a flow of air. For this purpose the pelt board has a plurality of openings or apertures for allowing drying air to pass through the pelt board. Drying air is received at the bottom part of the pelt board and passes via the inside of the hollow pelt board through the pelt board and pelt. The drying air thus actively removes moist and water from the pelts and thus the total drying time is significantly reduced compared to using wooden pelt boards.

[0004] The pelt boards are typically placed in a drying unit for drying. The drying unit comprises a shallow box shaped unit defining an inner space and a blowing unit. The drying unit defines a top surface having a number of apertures. The pelt boards have a connecting element at the bottom end. The connecting element is received and arrested in the apertures. The blowing unit forces an air flow into the inner space and into the bottom end of the pelt boards via the apertures. Each drying unit typically has in the range of 25-100 apertures allowing a corresponding number of pelt boards and associated pelts to be dried. The drying units are often movable simplifying the transport of a plurality of pelt boards and allowing the drying to take place in a room having an increased exchange of air.

[0005] Examples of such drying units may be found in the applicants own international applications WO 2005/026394 A1 and WO 2007/085269 A1, disclosing a method and drying unit for drying out the leather side of a pelt stretched out and fixed in this position on a pelt board, and, a device for performing complete- or partial emptying/filling of a drying aggregate with upstanding expansion pelt boards, respectively.

[0006] The use of forced convection in the form of a blower generating a stream of drying air through the pelts reduces the total drying time significantly compared to drying by means of solid pelt board relying entirely on natural convection. The drying time may be improved further by increasing the capacity of the blower to generate a more powerful stream of drying air. However, the applicant has found out that increasing the intensity of the drying air stream may lead to a too fast drying or over-drying of the pelt which may lead to a reduced quality of the pelt and/or formation of spots or marks on the pelt. There is thus a need for drying units capable of drying the pelts at a suitable drying intensity and leaving a small amount of residual moist.

[0007] Further, the applicant has found out that the classic drying units do not necessarily deliver the same amount of drying air through all of its apertures. By increasing the capacity of the blower and thereby increasing the flow velocities, the difference between the apertures becomes even more apparent. Having approximately the same flow of air is important since it will allow all of the pelts of a drying unit to be appropriately dried out. Otherwise the problem will arise where some of the pelts of a drying unit are over-dried while some are still moist. Thus, it is an object of the present invention to achieve technologies for allowing more efficient drying of pelts using a drying unit and to avoid the above-mentioned problem.

Summary of the invention

[0008] The above need and the above object is according to the teachings of the present invention achieved in a first aspect of the present invention by a drying unit for accommodating a plurality of elongated hollow pelt boards, each of the pelt boards having a pelt board top, a pelt board bottom and a connecting element at the pelt board bottom, the drying unit defining:

- an top plate having a number of apertures, each of the apertures being adapted for accommodating the connecting element,
- a bottom plate being parallel to and spaced apart from the top plate,
- a gas inlet for receiving a stream of gas, preferably air, and

a side wall interconnecting the top plate and the bottom plate in a fluid-tight manner for establishing an inner space between the top plate, the bottom plate, the gas inlet and the side wall, the side wall having an extent such that the top plate and the bottom plate being capable of defining a distance between themselves of at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm.

[0009] The drying unit defines a inner space bounded by the top plate facing upwards, the bottom plate facing the ground, the side wall and the gas inlet. It is contemplated that the bottom plate may be omitted and that the surface of the floor of the room may be used as bottom plate. The top plate has apertures which are used for arresting the connecting element of the pelt board. Typically, 200 pelt boards may be accommodated on one drying unit. The apertures also distribute drying gas, preferably air, from the inner volume to the hollow pelt board via the bottom of the pelt board. The gas is received by the inner space via the gas inlet, preferably in a direction which is perpendicular to the direction of the pelt boards.

[0010] Standard drying units according to the prior art, which are on the market today, e.g. marketed by the applicant company, are made very shallow, i.e. the top surface is located very low, such as about 100mm above the bottom plate, i.e. the inner height of the inner space is about 100mm. The reason for this is the fact that the pelt boards are quite tall, about 1-1,5 meters or more. In order to be able to place and remove the pelt boards on the top surface of the drying unit in an ergonomically way, and to be able to move the drying unit safely through doors etc., it has been desirable to make the distance between the top plate and the bottom plate as small as possible.

[0011] The applicant has performed numerous experiments and found out that the standard shallow drying units will not distribute the stream of air from the gas inlet equally among the apertures when high flow velocities are used. High flow velocities cause various flow effects such as increase of pressure, pressure waves, flow separation and turbulence, which in turn make the air flow through each aperture very unpredictable. This may lead to an uneven drying among the pelts on the pelt boards placed in the drying unit. The solution to this problem is to make the distance between the top plate and the bottom plate larger so that the inner space of the drying unit defines a greater volume. This will allow the flow velocity within the drying unit to be maintained while the total volume of gas flowing through the inner volume may be increased. Thus, the negative flow effects mentioned above may be minimized.

[0012] Thus, it is suggested by the present applicant that the inner height of the inner space of the drying aggregate is made higher, such as 200mm, effectively doubling the volume of the inner space compared to standard drying units on the market today. In order to be able to work with the drying unit both efficiently and ergonomically in an industrial environment, the above-mentioned preferred ranges are suitable.

[0013] According to a further embodiment of the first aspect, the side wall is flexible and wherein the drying unit further comprising a lifting device interconnecting the bottom plate and the top plate, the lifting device being capable of moving the top plate and the bottom plate relative to one another between a first position in which the top plate and the bottom plate being adjacent each other, and a second position in which the top plate and the bottom plate being distant each other, the lifting device optionally being lockable by a locking device.

[0014] Increasing the height of the drying unit has the drawback that the ergonomically aspect of the use of the drying unit is made worse, since the user has to lift the pelt board to and from a higher location. In order to be able to benefit from both an improved gas flow distribution among the apertures while maintaining the shallow profile of the drying unit during placement and removal of the pelt boards as well as during transport of the drying unit, the side wall may be made flexible, i.e. capable of defining a larger and smaller area, and the drying unit may be provided with a lifting device capable of moving the top plate and the bottom plate relative to one another. It is understood that the plates and wall as such of the drying unit are substantially pressure proof, i.e. the flexible side wall should be able to define a larger area without opening any apertures in the side wall.

[0015] In this way, the top plate and the bottom plate may be adjacent each other, such as 100mm apart, during placement and removal of the pelt boards as well as during transport of the drying unit. When the drying is about to start, the top plate and the bottom plate may be moved apart, making the drying unit higher, such as at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm. In this way the flow distribution is improved when needed during drying whereas the ergonomically friendly height is maintained for the user.

[0016] In order to spare the lifting device from excessive loads and long time wear, a locking device may be provided for mechanically locking the distance between the top plate and the bottom plate at specific distances.

[0017] According to a further embodiment of the first aspect, the flexible side wall comprise a first side wall element being connected to the top plate and a second side wall element connected to the bottom element, the first side wall element and the second side wall element being fluid tightly interconnected in a telescopic configuration.

[0018] In this way the distance between the bottom plate and the top plate may be efficiently moved between the first contracted position and the second extended position, in which the second position is effectively constituting twice the height of the drying unit, and thereby twice the inner volume, compared to the first position. More elements may be used

to reach even higher levels and thereby even larger inner volumes.

[0019] According to a further embodiment of the first aspect, the flexible side wall comprise an elastic and/or pleated and/or rolled up element.

[0020] The flexible side wall may e.g. be pleated or elastic in order to be able to be reshaped in a way such that the distance between the bottom plate and the top plate may be changed without opening any apertures in the side wall. It may also be rolled up on a rod and rolled up/down as the distance between the bottom plate and the top plate is changed, much like a roll-up curtain.

[0021] According to a further embodiment of the first aspect, the lifting device being located within the inner space and/or the lifting device comprising a guiding element extending from the bottom plate and through the top plate.

[0022] Preferably, the lifting device is within the inner space in order to save space. Further, in order to increase the stability when the top plate and the bottom plate are spaced apart, the lifting device may comprise a guiding element, e.g. in the form of bars.

[0023] According to a further embodiment of the first aspect, the lifting device constitutes a hydraulic or pneumatic lifting device or a mechanical lifting device such as a pantograph having a mechanical advantage between 1 and 10, preferably between 2 and 5 and preferably driven by an electrical motor, a hydraulic cylinder or alternatively including a gear mechanism for being manually operated by a user.

[0024] The lifting device may thus be either manual using a gear for leverage, powered, or even automatically controlled. A pantograph having a leverage or mechanical advantage may e.g. be used. The mechanical advantage reduces the mechanical stress on the lifting device during the movement of the top plate relative to the bottom plate.

[0025] According to a further embodiment of the first aspect, the gas inlet connected to an on board air blower capable of transporting air from outside the drying unit into the inner space and out through the apertures.

[0026] In order to be able to use air as drying gas, a blower may be used forcing ambient air into the inner space through the gas inlet. The blower may be fixated to and essentially made part of the drying unit.

[0027] According to a further embodiment of the first aspect, the gas inlet is connectable to an external air blower capable of communicating with the gas inlet, the external air blower being capable of transporting air from outside the drying unit into the inner space and out through the apertures.

[0028] In order to make a more compact drying unit and free the blower for other uses when the pelt boards are placed on or removed from the drying unit, the blower may be external and capable of being connected to the gas inlet of the drying unit.

[0029] According to a further embodiment of the first aspect, the external air blower being capable of transporting air from an outdoor location into the inner space and out through the apertures.

[0030] Such an external blower may take outside air instead of ambient air. Air from the outside is typically drier than indoor air and thus has a higher drying effect.

[0031] According to a further embodiment of the first aspect, the air blower including a dehumidifier.

[0032] Further, in order to reduce the humidity of the drying air or drying gas, a dehumidifier may be used. In this way, the drying effect is increased as the drying air or gas may accept a higher amount of moist before being saturated. The dehumidifier may be used both in connection with the on board air blower as well as with the external air blower.

[0033] According to a further embodiment of the first aspect, the gas inlet being located in the side wall.

[0034] In this way space is saved since the complete top plate may be used for accommodating the pelt boards.

[0035] According to a further embodiment of the first aspect, the bottom plate being fitted with wheels.

[0036] In this way the drying unit may be easily transported.

[0037] According to a further embodiment of the first aspect, the bottom plate being fitted with feet such that the drying unit may be moved by the use of a floor conveyor, such as a forklift, jack lift or pallet jack.

[0038] Alternatively, wheels are replaced by feet in order to have a more stable positioning of the drying unit. The drying unit is thus moved by means of a floor conveyor.

[0039] According to a further embodiment of the first aspect, the drying unit comprises a flow distributor disposed within the inner space between the gas inlet and the top plate.

[0040] In order to ensure that the flow through each of the apertures is as uniform as possible, a flow distributor may be used. The flow distributor is understood to comprise one or more flow regulators or any other suitable means for achieving a uniform flow velocity and pressure distribution within the inner space and avoid recirculation, pressure waves, excessive turbulence and similar flow effects. Examples of air distributors may be found in the documents WO 2015/154729 A1, WO 2015/062559 A1, EP2578957 A1, EP 2573479 A2, which describe various ducts and elements used for air distribution in ventilation equipment. The air distributors described in the above cited prior art show some principle examples used in the ventilation industry but also suitable as flow distributors according to the present purpose. The flow distributor preferably extends below and at approximately equal distance from all of the apertures from the apertures of the top plate. Below follows some embodiments of a flow distributor suitable for the present purposes:

According to a further embodiment of the first aspect, the flow distributor comprises one or more flexible and gas

permeable hoses, or alternatively the flow distributor comprises a rigid or semirigid plate including one or more flexible vent members, or alternatively the flow distributor comprises rigid or semirigid flow guiding elements, or alternatively the flow distributor comprises walls within the inner space defining enclosed cells between the gas inlet and the top plate, each of the cells preferably comprising a fan.

[0041] One option is to use one or more flexible and gas permeable hoses. The hoses may be made of a flexible web material such as a web material of natural fibres or syntetic fibres, e.g. textile, allowing the gas to flow though the fine holes in the web material. In this way, any pressure fluctuations will be reduced due to the flexibility of the material in conjunction with the distributing effect of the plurality of apertures in the hose. The hose or hoses should preferably extend along a great portion of the inner space in order to distribute the flow equally over all of the apertures.

[0042] Alternatively, a rigid or semirigid plate with flexible vent members or flaps may be used for the same purpose. The rigid or semirigid plate divides the inner space and the flexible vent members should be distributed on the rigid or semirigid plate within the inner space for distributing the flow equally over all of the apertures. The flexible vent counteracts any pressure fluctuations by opening when subjected to a large pressure force while closing when the pressure force is smaller, thus limiting the maximum flow though the vent.

[0043] Alternatively, rigid or semirigid flow guiding elements are used, which cause the flow of drying air to divide into multiple parts and each part of the flow is directed towards a separate aperture or group of apertures. In this way, most of the above mentioned negative flow effects, such as recirculation, are counteracted largely. The flow distributor may even comprise walls, which form cells dividing the inner space into separate spaces, which communicate with separate groups of apertures. Each cell may comprise an individual fan which may be controlled to achieve a uniform flow between the different cells and within each of the cells.

[0044] According to a further embodiment of the first aspect, the drying unit comprises a plurality of gas inlets disposed at the bottom plate and/or the top plate and/or the side plate.

[0045] In this way, the flow is more uniformly distributed already when entering the inner space.

[0046] According to a further embodiment of the first aspect, the apertures include a nozzle for conditioning the stream of air and/or the apertures including an adapter made of polymeric material and adapted for interconnecting with the connecting element of the pelt board and/or a nozzle.

[0047] A nozzle may be used forming a flow constriction in the aperture thus allowing a higher pressure to build up in the inner space. In this way, the flow will be more uniform between the nozzles.

[0048] An adapter may be used for providing a more stable positioning of the pelt boards on the top plate. The adapters are fixated in a respective aperture of the top plate. The adapter has a shape which corresponds to the connecting element of the pelt board such that the pelt board is held in a stable position. Thus, the adapters may be used to provide an interface between various types of pelt boards having connecting elements of different size and thus the same drying unit may be shipped with various adapters for being compatible with different pelt boards.

[0049] The above need and the above object is according to the teachings of the present invention achieved in a second aspect of the present invention by a method of drying a pelt by providing a drying unit, the drying unit defining:

an top plate having a number of apertures,
a bottom plate being parallel to and spaced apart from the top plate,
a gas inlet for receiving a stream of gas, preferably air, and
a side wall interconnecting the top plate and the bottom plate in a fluid-tight manner for establishing an inner space between the top plate, the bottom plate, the gas inlet and the side wall, the side wall having an extent such that the top plate and the bottom plate being capable of defining a distance between themselves of at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm, and

the method further comprising the steps of:

accommodating the pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and a connecting element at the pelt board bottom,
accommodating the connecting element of the pelt board in one of the apertures of the top plate, and
introducing gas, preferably air into the inner space for causing the gas to flow into the pelt board via the one aperture.

[0050] The above method according to the second aspect is preferably used together with the above drying unit according to the first aspect with a fixed side wall.

[0051] The above need and the above object is according to the teachings of the present invention achieved in a third aspect of the present invention by a method of drying a pelt by providing a drying unit, the drying unit defining:

an top plate having a number of apertures,
 a bottom plate being parallel to and spaced apart from the top plate,
 a gas inlet for receiving a stream of gas, preferably air, and
 a flexible side wall interconnecting the top plate and the bottom plate in a fluid-tight manner for establishing an inner
 space between the top plate, the bottom plate, the gas inlet and the flexible side wall, the side wall having an extent
 such that the top plate and the bottom plate being capable of defining a distance between themselves of at least
 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between
 300mm and 800mm, most preferably between 400mm and 600mm, and
 a lifting device interconnecting the bottom plate and the top plate, the lifting device being capable of moving the top
 plate and the bottom plate relative to one another,

the method further comprising the steps of:

accommodating the pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and a
 connecting element at the pelt board bottom,
 moving the lifting device to a first position in which the top plate and the bottom plate are adjacent each other,
 accommodating the connecting element of the pelt board in one of the apertures of the top plate,
 moving the lifting device to a second position in which the top plate and the bottom plate are distant each other, and
 introducing gas, preferably into the inner space for causing the gas to flow into the pelt board via the one aperture.

[0052] The above method according to the third aspect is preferably used together with the above drying unit according to the first aspect with a flexible side wall and a lifting device.

[0053] The above need and the above object is according to the teachings of the present invention achieved in a fourth aspect of the present invention by a drying unit for accommodating a plurality of elongated hollow pelt boards, each of the pelt boards having a pelt board top, a pelt board bottom and a connecting element at the pelt board bottom, the drying unit defining:

a top plate having a number of apertures, each of the apertures being adapted for accommodating the connecting
 element,
 a bottom plate being parallel to and spaced apart from the top plate,
 a gas inlet for receiving a stream of gas, preferably air, and

a side wall interconnecting the top plate and the bottom plate in a fluid-tight manner for establishing an inner space
 between the top plate, the bottom plate, the gas inlet and the side wall, the drying unit comprising a flow distributor
 disposed within the inner space between the gas inlet and the top plate.

[0054] Alternatively or in conjunction with said drying unit according to the first aspect and the methods according to the second and third aspects, the drying unit may be provided with a flow distributor in order to prevent the negative flow effects associated with high flow velocities for achieving a quicker drying of the pelt as described above. Thus, in case it is not feasible to increase the height of the drying unit or in case where a low drying unit is desired for any reason, a flow distributor may be used for preventing recirculation areas and similar flow effects which contribute to an uneven distribution of the flow between the apertures.

[0055] Further, in case the increase of the height of the drying unit is not sufficient for preventing the negative flow effects or in cases very high flow velocities are used for achieving an even quicker drying of the pelts.

[0056] The flow distributor is adapted to provide a substantially uniform gas flow through the apertures. The flow distributor may be any form of physical flow guide, which influences the flow direction, velocity or pressure after the flow has entered the inner space and before the flow exits the aperture, and which has the purpose of achieving an uniform distribution of the flow through the apertures.

[0057] According to a further embodiment of the fourth aspect, the flow distributor comprises one or more flexible and gas permeable hoses, or alternatively the flow distributor comprises a rigid or semirigid plate including one or more flexible vent members, or alternatively the flow distributor comprises rigid or semirigid flow guiding elements, or alternatively the flow distributor comprises walls within the inner space defining enclosed cells between the gas inlet and the top plate, each of the cells preferably comprising a fan.

[0058] The above flow distributors are preferably used and as such all of the above flow distributors, which have already been described in detail in connection with the first aspect, are equally applicable with the drying unit according to the fourth aspect as well as the associated method described below.

[0059] The above need and the above object is according to the teachings of the present invention achieved in a fifth aspect of the present invention by a method of drying a pelt by providing a drying unit, the drying unit defining:

a top plate having a number of apertures,
a bottom plate being parallel to and spaced apart from the top plate,
a gas inlet for receiving a stream of gas, preferably air, and
a side wall interconnecting the top plate and the bottom plate in a fluid-tight manner for establishing an inner space
between the top plate, the bottom plate, the gas inlet and the side wall, the drying unit comprises a flow distributor
disposed within the inner space between the gas inlet and the top plate,

the method further comprising the steps of:

accommodating the pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and a
connecting element at the pelt board bottom,
accommodating the connecting element of the pelt board in one of the apertures of the top plate, and
introducing gas, preferably air, into the inner space for causing the gas to flow into the pelt board via the one aperture.

[0060] The above method according to the fifth aspect is preferably used in together with the drying unit according to
the fourth aspect.

[0061] The above need and the above object is according to the teachings of the present invention achieved in a sixth
aspect of the present invention by a pelt processing system comprising:

a tanning unit for tanning a pelt which has been fixated to an expanded pelt board having a pelt board top, a pelt
board bottom and a connecting element at the pelt board bottom, the pelt board further being operable between an
expanded state and a non-expanded state by moving the connecting element relative to the pelt board bottom,
a holding unit for accommodating a plurality of the elongated hollow pelt boards, the holding unit defining a top plate
having a number of apertures, each of the apertures being adapted for accommodating the connecting element,
a blowing unit compatible with the holding unit and comprising a bottom plate being parallel to and spaced apart
from the top plate, a gas inlet for receiving a stream of gas, preferably air, and a side wall for interconnecting with
the top plate in a fluid-tight manner for establishing an inner space between the top plate, the bottom plate, the gas
inlet and the side wall, and
a release mechanism for causing the pelt boards on the holding unit to assume the non-expanded state.

[0062] An example of a tanning unit suitable in the present circumstances is described in WO 2005/028682 A1. The
tanning unit stretches and fastens the pelt on the expanded pelt board. The holding unit may be made very light since
it must not include any mechanical parts, blowers or flow distributors. Wheels are as well optional as the holding unit
may be moved by means of a floor conveyor. It must merely be capable of holding the pelt boards in a substantially
stable position. This may be done by apertures in the top plate in conjunction with adapters as described above.

[0063] The blowing unit may be stationary and as the holding unit is connected to the blowing unit the inner space is
formed in-between the blowing unit and the holding unit. The release mechanism may be included in the blowing unit
or it may be a stand alone unit. The release mechanism constitutes an actuator, which acts on the connecting elements
on the pelt board in order to cause all of the pelt boards to assume the non-expanded state. The non-expanded state
is used when the pelts are removed from the pelt boards.

[0064] The present pelt processing system according to the sixth aspect is preferably modular in that the tanning unit,
holding unit, blowing unit and release mechanism are separate stand alone units.

[0065] The above need and the above object is according to the teachings of the present invention achieved in a
seventh aspect of the present invention by a method of drying a pelt by providing a drying system, the drying system
comprising:

a tanning unit for tanning a pelt which has been fixated to an expanded pelt board having a pelt board top, a pelt
board bottom and a connecting element at the pelt board bottom,
a holding unit defining a top plate having a number of apertures, each of the apertures being adapted for accom-
modating the connecting element,
a blowing unit compatible with the holding unit and comprising a bottom plate being parallel to and spaced apart
from the top plate, a gas inlet for receiving a stream of gas, preferably air, and a side wall interconnecting the top
plate and the bottom plate in a fluid-tight manner for establishing an inner space between the top plate, the bottom
plate, the gas inlet and the side wall, and
a release mechanism for causing the pelt board on the holding unit to assume the non-expanded state.

the method further comprising the steps of:

providing a pelt board, the pelt board having a pelt board top, a pelt board bottom and a connecting element at the pelt board bottom, the pelt board further being adjustable between an expanded state and a non-expanded state by operating the connecting element,
 5 accommodating the pelt on the elongated hollow pelt board being in the expanded state,
 accommodating the connecting element of the pelt board in one of the apertures of the top plate,
 interconnecting the holding unit and the blowing unit by optionally lifting the holding unit,
 introducing gas, preferably air, into the inner space for causing the gas to flow into the pelt board via the one aperture,
 disconnecting the holding unit and the blowing unit, and
 10 operating the release mechanism thereby causing the pelt board to assume the non-expanded state.

[0066] By operating the release mechanism, all pelt boards are caused to assume the collapsed state. The release mechanism may be manual or automated.

[0067] The method according to the seventh aspect is preferably used together with the system according to the sixth aspect.

Brief description of the drawings

[0068]

FIG. 1A is a perspective view of a drying unit in a first low position.
 FIG. 1B is a perspective view of a drying unit in a second high position.
 FIG. 2A is a side view of a mechanical drying unit in a first low position.
 FIG. 2B is a side view of a mechanical drying unit in a second high position.
 FIG. 3A is a side view of a hydraulic drying unit in a first low position.
 25 FIG. 3B is a side view of a hydraulic drying unit in a second high position.
 FIG. 3C is a side view of another hydraulic drying unit using a roll-up element.
 FIG. 3D is a side close-up view of the roll-up mechanism of the above drying unit.
 FIG. 4A is a side view of a drying unit and an external blower.
 FIG. 4B is a side view of a drying unit connected to an external blower.
 30 FIG. 5A is a side view of a drying unit having feet and a floor jack.
 FIG. 5B is a side view of a drying unit having feed when moved to an external blower.
 FIG. 6 is a perspective view of a drying unit having a fixed height.
 FIG. 7A is a perspective exploded view of a drying unit having multiple hoses.
 FIG. 7B is a perspective view of the above drying unit having hoses as flow distributor.
 35 FIG. 8A is a perspective cut-out view of the above drying unit having multiple hoses.
 FIG. 8B is a perspective view of the above drying unit showing the flow of air.
 FIG. 9A is a perspective view of the air flow in a hose as a flow distributor.
 FIG. 9B is a perspective view of the air flow in another hose as a flow distributor.
 FIG. 10 is a perspective view of a drying unit having one large hose as flow distributor.
 40 FIG. 11A is a side view of the above drying unit having one large hose.
 FIG. 11B is a side view of a drying unit having a flexible membrane.
 FIG. 11C is a side view of a drying unit having a plate and flexible vent members.
 FIG. 12A is a perspective view of a drying unit having multiple side inlets.
 FIG. 12B is a perspective view of a drying unit having multiple bottom inlets.
 45 FIG. 13A is a perspective view of a drying unit having flow guiding plates.
 FIG. 13B is a perspective view of a drying unit having hoses with opposing fixation.
 FIG. 13C is a perspective view of a drying unit having tapered hoses.
 FIG. 14A is a perspective view of a drying unit having cells and fans.
 FIG. 14B is a perspective view of a drying unit having cells, fans and bags.
 50 FIG. 15 is a side view of a mechanical lifting device using a first pantograph.
 FIG. 16 is a side view of a mechanical lifting device using a second pantograph.
 FIG. 17 is a side view of a mechanical lifting device using a third pantograph.
 FIG. 18A is a side/front cut-out view of a high drying unit having a guiding element.
 FIG. 18B is a side/front cut-out view of a low drying unit having a guiding element.
 55 FIG. 19A is a perspective exploded view of a drying unit according to the state of art.
 FIG. 19B is a perspective view of a drying unit according to the state of the art.
 FIG. 19C is a perspective side view of a drying unit according to the state of the art.
 FIG. 20A is a perspective exploded view of a drying unit having hoses.

FIG. 20B is a perspective view of a drying unit having hoses.
 FIG. 20C is a perspective side view of a drying unit having hoses.
 FIG. 21A is a perspective exploded view of a high drying unit.
 FIG. 21B is a perspective view of a high drying unit.
 FIG. 21C is a perspective side view of a high drying unit.
 FIG. 22A is a perspective view of an adapter.
 FIG. 22B is a top view of an adapter.
 FIG. 22C is a front view of an adapter.
 FIG. 22D is a bottom view of an adapter.
 FIG. 22E is a side view of an adapter.
 FIG. 23A is a side view of an adapter and a large connecting element.
 FIG. 23B is a side view of an adapter attached to a large connecting element.
 FIG. 23C is a side view of an adapter and a large connecting element when drying.
 FIG. 24A is a side view of an adapter and a small connecting element.
 FIG. 24B is a side view of an adapter attached to a small connecting element.
 FIG. 24C is a side view of an adapter and a small connecting element when drying.
 FIG. 25 is a side view of an adapter.
 FIG. 26A is a side view of an adapter having a check valve in a closed state.
 FIG. 26B is a side view of an adapter having a check valve in an open state.
 FIG. 27 is a perspective view of a pelt processing system.
 FIG. 28A is a perspective view of an alternative pelt processing system.
 FIG. 28B is a perspective view of the alternative system during assembly.
 FIG. 28C is a perspective view of the alternative system during operation.
 FIG. 29A is a CFD simulation of a low drying unit viewed from the side.
 FIG. 29B is a CFD simulation of a low drying unit viewed from the top.
 FIG. 29C is a CFD simulation of low interface.
 FIG. 29D is a CFD simulation of a high interface.
 FIG. 29E is a CFD simulation of a pelt board.
 FIG. 29F is a CFD simulation of a high drying unit viewed from the side.
 FIG. 29G is a CFD simulation of a high drying unit viewed from the side.

Detailed description of the drawings

[0069] FIG. 1A shows a perspective view of a drying unit 10 in a first low position. The drying unit comprise a top plate 12, a flexible side wall 14 and a bottom wall (not visible) opposite the top wall 12. The top wall 12 is provided with apertures 16. Each of the apertures 16 are adapted for accommodating a pelt board 18. The pelt board 18 has an elongated and convex shape defining a top 20 and a bottom 22, and accommodate a pelt (not shown) stretched onto the outside of the pelt board 18. The pelt board 18 is hollow and adapted for receiving air from the corresponding aperture 16. The air is delivered from an on board blower 24 via an inner space of the drying unit 10. For easy transportation, the drying unit is provided with a handle 26 and wheels 28. The side wall 14 is flexible and in the present view the drying unit 10 is in the low position suitable such that the top plate 12 has a suitable height for a user placing and removing pelt boards 18 from the top plate 12. The distance between the bottom plate and the top plate 12 is typically below 200mm, such as 100mm.

[0070] FIG. 1B shows a perspective view of the drying unit 10 in a second high position. The flexible side wall 14 in the present embodiment is telescopic comprising a second side wall element 14'. In this way the volume of the inner space of the drying unit 10 is doubled, allowing the air flow through the inner space of the drying unit 10 to define a lower velocity and thereby a more uniform flow pattern. This position is suitable for the drying operation. The distance between the bottom plate and the top plate is at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm

[0071] FIG. 2A shows a side view of a mechanical drying unit 10' in a first low position. The inner space 30 is visible in a cut-through perspective, and it can be seen that a connecting element 32 of the pelt board 18 reaches into the inner space 30 and arrests the pelt board 18. A mechanical lifting device 34 is located in the inner space between the top plate 12 and the bottom plate 36. The mechanical lifting device 34 may e.g. be driven by an electrical motor (not shown) or by hand via a gear (not shown).

[0072] FIG. 2B shows a side view of the mechanical drying unit 10' in a second high position. The top plate 12 is raised from the bottom plate 36 by using the mechanical lifting device 34 as shown by the arrows thereby increasing the volume of the inner space 30. The flexible wall has two elements 14, 14' which are sealed in a telescopic configuration.

[0073] FIG. 3A shows a side view of a hydraulic drying unit 10" in a first low position similar to the previous embodiment,

however, the lifting device 34' is hydraulic (or pneumatic) and the flexible side wall 14" is pleated.

[0074] FIG. 3B shows a side view of the hydraulic drying unit in a second high position, similar to the previous embodiment. It should be noted that combinations of the above embodiment 10' and 10" are possible such as a drying unit having a hydraulic lifting device and a telescopic side wall or a as a drying unit having a mechanical lifting device and a pleated side wall.

[0075] FIG. 3C shows a side view of another hydraulic drying unit using a roll-up element 14'" instead of the pleated wall. The roll-up element 14'" is resembling a roll-up curtain made of fluid tight flexible material and is fixated between the top plate 12 and the bottom plate 36. The top plate 12 comprises a roll-up mechanism 35, which is described in more detail below.

[0076] FIG. 3D is a side close-up view of the roll-up mechanism 35 of the above drying unit 10". The roll-up mechanism comprises a cylinder 37, which may either be motor driven or tensioned by a spring or the like so that there is always tension in the roll-up element 14'" between the top plate 12 and the bottom plate 36.

[0077] FIG. 4A shows a side view of a drying unit 10 having a gas inlet 38, which is capable of cooperating with an external blower 40. The external blower receives air from an outside unit 42.

[0078] FIG. 4B shows a side view of the drying unit 10 when connected to the external blower 40. The air flows from the outside 42 via the blower 40, the gas inlet 38, the inner space 30 through the apertures 16 in the top plate 12 into the pelt board 18, through the pelt as shown by the arrows.

[0079] FIG. 5A shows a side view of a drying unit 10 having feet 44 and a floor jack 46 for moving the drying unit 10. In this way the drying unit 10 must not have wheels and may be positioned more stable.

[0080] FIG. 5B shows a side view of a drying unit 10 having feet 44 when moved to an external blower 40. Of course, a drying unit having feet and an on board blower would be equally feasible.

[0081] FIG. 6 shows a perspective view of a drying unit 10'" having a fixed height. This may be considered an economic solution in which the flow pattern is improved and no lifting device is needed, thus saving some costs, however, in this way the ergonomics will be less optimal compared to the prior art. The distance between the bottom plate adjacent the ground and the top plate will thus be at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm.

[0082] FIG. 7A shows a perspective exploded view of a drying unit 10 having multiple hoses 48a-f as flow distributor. The hoses 48a-f are made of a flexible web material of natural or synthetic fibers, and form a flexible textile. The flow inlet 38' corresponds to the hoses 48a-f.

[0083] FIG. 7B shows a perspective view of the above drying unit 10 in a first low position. The drying unit 10 is assembled and the hoses 48 are inside the inner space of the drying unit and as such visible anymore.

[0084] FIG. 8A shows a perspective cut-out view of the above drying unit 10 having multiple hoses 48a-f. As the blower 24 forces air into the flow inlet 38, the air distributes in the hoses 48a-f. The hoses 48a-f extend into the inner space 30 of the drying unit 10 and together cover the bottom plate 36 more or less completely. The air penetrates the gaps in the web structure of the hoses in a substantially uniform way and distributes within the inner space 30. The hoses 48a-f effectively splits the inner space 30 into a lower part, which is in fluid communication with the inlet 38" and an upper part in fluid communication with the apertures 16 of the top plate 12. When air (or gas) is introduced into the hoses 48a-f through the inlet 38", a pressure difference will be established over the hoses 48a-f causing the hoses to 48a-f inflate and expand. The air leaks through the web material of the hoses and the higher the pressure difference, the more the hoses will expand and the gaps in the web material of the hoses 48a-f will be larger, allowing more air to penetrate. In this way, the pressure is uniformly distributed within the hoses 48a-f.

[0085] FIG. 8B shows a perspective view of the above drying unit 10 showing the flow of air through the apertures 16. The flow originates from the hoses as described in the previous figure and the flow is substantially uniform between the apertures 16.

[0086] FIG. 9A shows a perspective view of the air flow in a hose 48 as a flow distributor. The air flow is substantially uniform in all directions since the complete hose 48 is made of a flexible web material.

[0087] FIG. 9B shows a perspective view of the airflow in another hose 48' as a flow distributor. The air flow is substantially uniform through the upper side of the hose 48', i.e. the part of the hose 48' facing the top plate, whereas there is no flow through the lower side of the hose 48', i.e. the part of the hose 48' facing the bottom plate. The upper part of the hose is thus made of a flexible web material, whereas the lower part of the hose 48' is made of a fluid tight material such as rubber. In this way, most of the flow may be directed towards the upper plate, which may further reduce turbulence and other negative flow effects within the inner space 30.

[0088] FIG. 10 shows a perspective view of a drying unit 10 having one large hose 48" as flow distributor. The large hose 48", which is made of a flexible web material, may be manufactured to extend into the inner space 30 to cover most of the bottom plate 36 and effectively splits the inner space 30 into a lower part, which is in fluid communication with the inlet 38" and an upper part in fluid communication with the apertures 16 of the top plate 12.

[0089] FIG. 11A shows a side view of the above drying unit 10 having one large hose 48". The uniform structure of the large hose yields a uniform flow distribution in the inner space 10 above the large hose 48". The large hose 48" may

be manufactured in the same material as the previous hoses and optionally with a fluid tight lower part.

[0090] FIG. 11B shows a side view of a drying unit 10 having a flexible membrane 48" made of a web material. The membrane 48" extends between the side walls 14 and effectively splits the inner space 30 into a lower part, which is in fluid communication with the inlet 38" and an upper part in fluid communication with the apertures 16 of the top plate 12. The membrane 48" may be manufactured in the same material as the above-mentioned large hose and optionally with a fluid tight lower part. The working principle is similar to the large hose.

[0091] FIG. 11C shows a side view of a drying unit 10 having a flow guiding plate 50 comprising flexible vent members 52. The flow guiding plate 50 extends between the side walls 14 and effectively splits the inner space 30 into a lower part, which is in fluid communication with the inlet 38" and an upper part in fluid communication with the apertures 16 of the top plate 12. The vent members 52 consist of flexible flaps, which are closed or exhibit a small opening when the pressure difference over the flow guiding plate 50 is low or non-existent. At higher pressure differences over the plate the flaps will exhibit a larger opening, thus mimicking the effect of the flexible hoses described above.

[0092] FIG. 12A shows a perspective view of a drying unit 10 having multiple side inlets 38a-f. The side inlets 38a-f are distributed on the side walls 16 of the drying unit 10 for achieving a uniform flow pattern in the inner space 30.

[0093] FIG. 12B shows a perspective view of a drying unit 10 having multiple bottom inlets 38a-f. The bottom inlets 38a-f are distributed on the bottom plate 36 of the drying unit 10 for achieving a uniform flow pattern in the inner space 30. This setup has the advantage that the general flow direction of the air through the inner space 30 must not be redirected.

[0094] FIG. 13A shows a perspective view of a drying unit 10 having flow guiding plates 50' in the inner space 30. The flow guiding plates 50' mimic the side wall inlets of the previous embodiment. Air (or gas) is received through a common inlet 38" in the side wall 16. The air is led by the plates 50 and through openings 54, which are distributed along the circumference of the inner space for distributing the air within the inner space 30 and achieve a uniform flow pattern.

[0095] FIG. 13B shows a perspective view of a drying unit 10 having hoses 48a-c which are fixated on both sides. The hoses are similar to the previously described hoses, however, the hoses 48 do not extend from the gas inlet 38 but from openings 54 in a flow guiding plate 50" within the inner space 30. This configuration may reduce any possible movement of the hoses within the inner space.

[0096] FIG. 13C shows a perspective view of a drying unit 10 having hoses 48a-f which are tapered. The hoses are similar to the previously described hoses but are only fixated on one side. The hoses 48 thus extend from openings 54 in a flow guiding plate 50" within the inner space 30 in an alternating configuration. The hoses may thus be made shorter and the movement of the hoses reduced.

[0097] FIG. 14A shows a perspective view of a drying unit 10 having cells and fans 56. The cells are formed by plates 50", which divide the inner space 30 into separate spaces between a common inlet 38" and the top plate (not shown). Each cell is in fluid communication with a number of apertures (not shown) of the top plate (not shown). The number of apertures per cell may vary. In an extreme case each aperture may communicate with a separate cell. Each cell also optimally includes a fan 56 which fans may serve as the sole blowers or in conjunction with an on board or external blower as previously described. In this way, the cells will receive a constant flow of air and recirculation effect may be reduced.

[0098] FIG. 14B shows a perspective view of a drying unit 10 having cells, fans and bags 56'. The present embodiment is similar to the previous embodiments except that the fan is covered by a bag, which may be of the same material as the previously described hoses and thus have the same flow distributing effect.

[0099] FIG. 15 shows a side view of a mechanical lifting device using a mechanical lifting device 34" in the form of a first pantograph. The lifting device 34" comprises a first bar 58, which is attached to the bottom plate 36 and contacting the top plate 12 with a roller 60. The first bar 58 is connected to a second bar 58' via an axle 62 in the center of the first bar 58 and the second bar 58' is further attached to the top plate 12 opposite the first bar 58. By moving the roller 60, the distance of the top plate 12 relative to the bottom plate 36 may be adjusted in the vertical direction.

[0100] FIG. 16 shows a side view of a mechanical lifting device using a mechanical lifting device 34" in the form of a second pantograph. The lifting device 34" comprises a first bar 58 connected to rollers 60, which in turn contact the bottom plate 36 at opposite locations. Two separate bars 58' are connected between each of the rollers 60 via a respective axle 62 and opposite locations under the top plate 12. By moving the first bar 58 horizontally, the distance of the top plate 12 relative to the bottom plate 36 may be adjusted in the vertical direction.

[0101] FIG. 17 shows a side view of a mechanical lifting device using a mechanical lifting device 34" in the form of a third pantograph. The lifting device 34" comprises a first bar 58 attached to the bottom plate 36 at one end and at the opposite end connected to a roller 60, which in turn contacts the bottom plate 36. Two separate bars 58' are connected between each end of the first bar 58 via respective axles 62 and having opposite ends at opposite locations under the top plate 12, whereby the end located adjacent the roller 60 of the first bar 58 has a roller 60' contacting the top plate 12, whereby the end located adjacent the end of the first bar 58, which is attached to the bottom plate 36, is attached to the top plate 12, and whereby the two bars 58 cross at a central location, in which said bars 58 are interconnected by an axle 62. By moving the first bar 58 horizontally, the distance of the top plate 12 relative to the bottom plate 36 may be adjusted in the vertical direction.

[0102] FIG. 18A shows a side cut-out view of a high drying unit 10 having a guiding element 64. The side walls have been left out in order to visualize the inner space. The present view shows the drying unit 10 in the high position, which is preferably used during drying. The guide elements 64 64' are attached to the bottom plate 36 and extend through the upper plate 12 in order to provide stability in the high position.

[0103] Also shown is a front cut-out view of a high drying unit 10 having a guiding element 64. The guide elements form an inverted U.

[0104] FIG. 18B shows a side cut-out view of a low drying unit having a guiding element 64. The present view shows the drying unit 10 in the low position, which is preferably used during transport and handling.

[0105] Also shown is a front cut-out view of a low drying unit having a guiding element. The guide elements may double as handles for moving the drying unit 10.

[0106] FIG. 19A shows a perspective exploded view of a drying unit 10 according to the state of the art. The drying unit 10 is low and without any flow distributor.

[0107] FIG. 19B shows a perspective view of a drying unit according to the state of the art. The present view shows arrows representing the flow of air through the apertures 16 when the flow velocity is increased. As can be seen, the flow distribution is non-uniform as the flow velocity through some apertures 16 is very high, whereas the flow velocity through others even are negative.

[0108] FIG. 19C shows a perspective side view of a drying unit according to the state of the art. The present view shows arrows representing the flow of air within the inner space 30 in addition to the arrows representing the flow of air through the apertures 16. As can be seen, the flow velocity and turbulence is very intense close to the gas inlet 38 resulting in Venturi effect suction adjacent the gas inlet 38.

[0109] FIG. 20A shows a perspective exploded view of a drying unit 10 having hoses 48.

[0110] FIG. 20B shows a perspective view of a drying unit 10 having hoses 48. The present view shows arrows representing the flow of air through the apertures 16 when the flow velocity is increased. As can be seen, the flow distribution is uniform and the flow velocity through all of the apertures 16 are approximately the same.

[0111] FIG. 20C shows a perspective side view of a drying unit 10 having hoses 48. The present view shows arrows representing the flow of air within the inner space 30 in addition to the arrows representing the flow of air through the apertures 16. As can be seen, the presence of the flow distributor constituted by the hoses 48 reduces the turbulence and eliminates the Venturi effect suction adjacent the gas inlet 38.

[0112] FIG. 21A shows a perspective exploded view of a high drying unit 10.

[0113] FIG. 21B shows a perspective view of a high drying unit. The present view shows arrows representing the flow of air through the apertures 16 when the flow velocity is increased. As can be seen, the flow distribution is uniform and the flow velocity through all of the apertures 16 are approximately the same.

[0114] FIG. 21C shows a perspective side view of a high drying unit 10. The present view shows arrows representing the flow of air within the inner space 30 in addition to the arrows representing the flow of air through the apertures 16. As can be seen, the greater distance between the gas inlet 38 and the apertures 16 reduces the turbulence and eliminates the Venturi effect suction adjacent the gas inlet 38.

[0115] FIG. 22A shows a perspective view of an adapter 66 for being fixated in the aperture (not shown) of the top plate (not shown) of the drying unit (not shown). The adapter 66 has an inner shape corresponding to the shape of a pelt board connecting element (not shown) such that the pelt board connecting element may be easier placed in and more stable accommodated in the aperture (not shown). The adapter 66 is preferably made of polymeric material such as plastic. The adapter 66 comprise a clip-on mechanism for attachment to the top plate (not shown) of the drying unit (not shown).

[0116] FIG. 22B shows a bottom view of an adapter 66. As can be seen, the adapter 66 is hollow for allowing gas to pass through with little or no flow resistance.

[0117] FIG. 22C shows a front view of an adapter 66 when attached to the top plate 12 of the drying aggregate (not shown) at the aperture 16.

[0118] FIG. 22D shows a top view of an adapter 66.

[0119] FIG. 22E shows a side view of an adapter 66.

[0120] FIG. 23A shows a side view of an adapter 66 and a large connecting element 32 of the pelt board (not shown). The adapter 66 is fitted in the aperture 16 between the top plate 12 and a secondary top plate 12', which is similar to the top plate 12 but located below the top plate 12 within the inner space 30 for the purpose of fixating the adapter 66. The clip mechanism attaches to the secondary top plate 12', whereas a top portion 70 of the adapter 66 acts as counter hold.

[0121] FIG. 23B shows a side view of an adapter 66 attached to a large connecting element 32 of the pelt board (not shown). As can be seen, the adapter 66 assures a stable position of the pelt board connecting element 32

[0122] FIG. 23C shows a side view of an adapter 66 and a large connecting element 32 when drying. As shown by the arrow, the hollow configuration of the adapter 66 allows air to pass from the inner space 30 through the adapter 66 in the aperture 16 to the pelt board (not shown).

[0123] FIG. 24A shows a side view of an adapter 66' and a small connecting element 32' of the pelt board (not shown). The adapter 66 is fitted in the same aperture 16 between the top plate 12 and a secondary top plate 12', which is similar to the top plate 12, but located below the top plate 12 within the inner space 30 for the purpose of fixating the adapter 66'. The clip mechanism attaches to the secondary top plate 12' whereas a top portion 70 of the adapter 66' acts as counter hold. Thus, the same drying unit may be used with different adapters for differently sized connecting elements.

[0124] FIG. 24B shows a side view of an adapter 66' attached to a small connecting element 32' of the pelt board (not shown). As can be seen, the adapter 66' assures a stable position of the pelt board connecting element 32'

[0125] FIG. 24C shows a side view of an adapter 66' and a small connecting element 32' when drying. As shown by the arrow, the hollow configuration of the adapter 66' allows air to pass from the inner space 30 through the adapter 66' in the aperture 16 to the pelt board (not shown).

[0126] FIG. 25 shows a side view of an adapter 66" for use with a corrugated top plate 12". The present adapter 66' is held at only one location, however, it would be equally feasible to provide a secondary top plate for allowing the adapter to be held at two locations for additional stability as shown above. Further, the present top plate 12" may be non-corrugated and/or used together with adapters of different sizes.

[0127] FIG. 26A shows a side view of an adapter 66"" having a check valve 72 in a closed state. When no pelt board connecting element is inserted into the adapter 66"", the check valve remains closed and thus no air will flow through the adapter 66"". In this way, any loss of drying gas/air through an aperture, which has no connecting element/pelt board attached, is prevented. Alternatively or in addition to a check valve a nozzle may be used for similar purposes.

[0128] FIG. 26B shows a side view of an adapter having a check valve in an open state. When a pelt board connecting element is inserted into the adapter 66"", the check valve 72 will open and permit drying air/gas to pass through.

[0129] FIG. 27 shows a perspective view of a pelt processing system 74. The pelt processing system comprises different modular stations in the form of a tanning unit 76, a holding unit 78, a blowing unit 80 and a release mechanism 82. The tanning unit 76 is the first station at which the pelt on the pelt board 18' is stretched when the pelt board is in its expanded state. The pelt and pelt board 18' are subsequently put in an holding unit 78 comprising a top plate 12 with apertures 16 for holding the connecting element 32 of the pelt board 18'. Then, the holding unit 78 is moved by e.g. a floor conveyor 46 to the blowing unit 80, which includes an external blower 40 and sidewalls 14. Together, the holding unit 78 and the blowing unit 80 form a drying unit for drying the pelts on the pelt boards. Finally, after drying the pelts, the holding unit 78 is moved to a release mechanism 82, at which all pelt boards are collapsed to their non-expanded state. The release mechanism may e.g. be driven by compressed gas via a compressor 84, however, other means such as an electric motor or even a hand lever, are equally feasible.

[0130] FIG. 28A shows a perspective view of an alternative embodiment of a pelt processing system 74'. The pelt processing system 74' comprises a holding unit 78' and a blowing unit 80'. The holding unit 78' comprises a top plate 12 with apertures for holding the connecting element of the pelt boards 18'. The blowing unit 80' comprises a blower 40', sidewalls 12 and a openable port 86. The bottom of the blowing unit 80' is constituted by the surface of the floor of the building in which the blowing unit 80' is situated. Further, a manual release mechanism 82' is provided for collapsing all of the pelt boards 18 simultaneously, however, a motorized release mechanism is equally feasible.

[0131] FIG. 28B shows a perspective view of the alternative embodiment of a pelt processing system 74' during assembly. The holding unit 78' has now been inserted into the blowing unit 80' by means of e.g. a floor jack or by wheels mounted on the holding unit 78'.

[0132] FIG. 28C shows a perspective view of the alternative embodiment of a pelt processing system 74' during operation. In order to seal off the blowing unit 80', the port 86 is closed as shown by the arrow and in order to for an inner space 30 to form, a lifting device 34" is used for elevating the holding device 78'. The present lifting device is in the form of a pantograph, however, a hydraulic or pneumatic lifting mechanism is equally feasible. Subsequently, the blower 40' is started for drying the pelts. The lifting device 34" and the blower 40' are controlled by a controller 88. The port 86 and the release mechanism 82' are typically manually operated, but may also be motorized and controlled by the controller 88.

[0133] The following figures 29A-G are self-explanatory proof-of-concept CFD (Computational Fluid Dynamics) simulations made in order to increase the understanding of the present invention.

[0134] FIG. 29A shows a CFD simulation of a low drying unit viewed from the side. The simulation shows the flow velocity inside the inner space. As can be seen, the flow velocity is non-uniform.

[0135] FIG. 29B shows a CFD simulation of a low drying unit viewed from the top. The simulation shows the flow volume per hour through the apertures. As can be seen, the flow volume per hour through the apertures is non-uniform.

[0136] FIG. 29C shows a CFD simulation of low interface/adaptor having less amount of air passing through.

[0137] FIG. 29D shows a CFD simulation of a high interface/adaptor allowing more air to pass from the drying unit to the pelt boards.

[0138] FIG. 29E shows a CFD simulation of a pelt board. A large flow channel creates an air flow through the whole pelt board.

[0139] FIG. 29F shows a CFD simulation of a high drying unit viewed from the side. The simulation show the flow

velocity inside the inner space. As can be seen, the flow velocity is much more uniform than the low drying unit.

[0140] FIG. 29G shows a CFD simulation of a high drying unit viewed from the top. The simulation show the flow volume per hour through the apertures. As can be seen, the flow volume per hour through the apertures is much more uniform than the low drying unit.

[0141] The above described embodiments describe specific realizations according to the present invention showing specific features, however, it is apparent to the skillful individual that the above described embodiments may be modified, combined or aggregated to form numerous further embodiments. For instance, the air blower may optionally include a heater or be replaced by a bottle of compressed gas.

Reference numerals with reference to the figures

[0142]

10. Drying unit	48. Hose
12. Top plate	50. Guiding plate
14. Side wall	52. Vent
16. Aperture	54. Openings
18. Pelt board	56. Fan
20. Top of pelt board	58. Bar
22. Bottom of pelt board	60. Roller
24. On board blower	62. Axle
26. Handle	64. Guide element
28. Wheels	66. Adapter
30. Inner space	68. Clip mechanism
32. Connecting element	70. Top portion
34. Lifting device	72. Check valve
35. Roll-up mechanism	74. Pelt processing system
36. Bottom plate	76. Tanning unit
37. Cylinder	78. Holding unit
38. Gas inlet	80. Blowing unit
40. External blower	82. Release mechanism
42. Outside unit	84. Compressor
44. Feet	86. Port
46. Floor jack	88. Controller

Claims

1. A drying unit for accommodating a plurality of elongated hollow pelt boards, each of said pelt boards having a pelt board top, a pelt board bottom and a connecting element at said pelt board bottom, said drying unit defining:

a top plate having a number of apertures, each of said apertures being adapted for accommodating said connecting element,

a bottom plate being parallel to and spaced apart from said top plate,

a gas inlet for receiving a stream of gas, preferably air, and

a sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing an inner space between said top plate, said bottom plate, said gas inlet and said sidewall, said drying unit comprising a flow distributor disposed within said inner space between said gas inlet and said top plate.

2. The drying unit according to claim 1, wherein said flow distributor comprises one or more flexible and gas permeable hoses, or alternatively said flow distributor comprises a rigid or semirigid plate including one or more flexible vent members, or alternatively said flow distributor comprises rigid or semirigid flow guiding elements, or alternatively said flow distributor comprises walls within said inner space defining enclosed cells between said gas inlet and said top plate, each of said cells preferably comprising a fan.
3. A drying unit for accommodating a plurality of elongated hollow pelt boards, each of said pelt boards having a pelt board top, a pelt board bottom and a connecting element at said pelt board bottom, said drying unit defining:
 - an top plate having a number of apertures, each of said apertures being adapted for accommodating said connecting element,
 - a bottom plate being parallel to and spaced apart from said top plate,
 - a gas inlet for receiving a stream of gas, preferably air, and
 - a sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing an inner space between said top plate, said bottom plate, said gas inlet and said sidewall, said sidewall having an extent such that said top plate and said bottom plate being capable of defining a distance between themselves of at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably between 300mm and 800mm, most preferably between 400mm and 600mm.
4. A drying unit according to any of the preceding claims, wherein said sidewall is flexible and wherein said drying unit further comprising a lifting device interconnecting said bottom plate and said top plate, said lifting device being capable of moving said top plate and said bottom plate relative to one another between a first position in which said top plate and said bottom plate being adjacent each other, and a second position in which said top plate and said bottom plate being distant each other, said lifting device optionally being lockable by a locking device.
5. The drying unit according to claim 4, wherein said flexible sidewall comprise a first sidewall element being connected to said top plate and a second sidewall element connected to said bottom element, said first sidewall element and said second sidewall element being fluid tightly interconnected in a telescopic configuration and/or said flexible sidewall comprise an elastic and/or pleated and/or rolled up element.
6. The drying unit according to any of the claims 4-5, wherein said lifting device being located within said inner space and/or said lifting device comprising a guiding element extending from said bottom plate and through said top plate, and/or said lifting device constitutes a hydraulic or pneumatic lifting device or a mechanical lifting device, such as a pantograph having a mechanical advantage between 1 and 10, preferably between 2 and 5 and preferably driven by an electrical motor, hydraulic cylinder or alternatively including a gear mechanism for being manually operated by a user.
7. The drying unit according to any of the claim 1-6, wherein said gas inlet is connected to an on board air blower capable of transporting air from outside said drying unit into said inner space and out through said apertures, said air blower preferably including a dehumidifier, and/or gas inlet being connectable to an external air blower capable of communicating with said gas inlet, said external air blower being capable of transporting air from outside said drying unit into said inner space and out through said apertures, said external air blower preferably being capable of transporting air from an outdoor location into said inner space and out through said apertures, said air blower preferably including a dehumidifier.
8. The drying unit according to any of the claims 1-7, wherein said gas inlet being located in said sidewall, preferably adjacent said bottom plate and/or said bottom plate being fitted with wheels and/or wherein said bottom plate being fitted with feet such that said drying unit may be moved by the use of a floor conveyor, such as a forklift, jack lift or pallet jack.
9. The drying unit according to any of the preceding claims, wherein said drying unit comprises a plurality of gas inlets disposed at said bottom plate and/or said top plate and/or said side plate.
10. The drying unit according to any of the preceding claims, wherein said apertures include a nozzle for conditioning said stream of air, and/or said apertures include an adapter made of polymeric material and adapted for interconnecting with said connecting element of said pelt board and/or a nozzle.
11. A method of drying a pelt by providing a drying unit, said drying unit defining:

an top plate having a number of apertures,
a bottom plate being parallel to and spaced apart from said top plate,
a gas inlet for receiving a stream of gas, preferably air, and
a sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing an inner
space between said top plate, said bottom plate, said gas inlet and said sidewall, said sidewall having an extent
such that said top plate and said bottom plate being capable of defining a distance between themselves of at
least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm, more preferably
between 300mm and 800mm, most preferably between 400mm and 600mm, and

said method further comprising the steps of:

accommodating said pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and
a connecting element at said pelt board bottom,
accommodating said connecting element of said pelt board in one of said apertures of said top plate, and
introducing gas, preferably air, into said inner space for causing said gas to flow into said pelt board via said
one aperture.

12. A method of drying a pelt by providing a drying unit, said drying unit defining:

an top plate having a number of apertures,
a bottom plate being parallel to and spaced apart from said top plate,
a gas inlet for receiving a stream of gas, preferably air, and
a flexible sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing
an inner space between said top plate, said bottom plate, said gas inlet and said flexible sidewall, said sidewall
having an extent such that said top plate and said bottom plate being capable of defining a distance between
themselves of at least 200mm, such as between 200mm and 2500mm, preferably between 250mm and 1000mm,
more preferably between 300mm and 800mm, most preferably between 400mm and 600mm, and

a lifting device interconnecting said bottom plate and said top plate, said lifting device being capable of moving said
top plate and said bottom plate relative to one another,
said method further comprising the steps of:

accommodating said pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and
a connecting element at said pelt board bottom,
moving said lifting device to a first position in which said top plate and said bottom plate are adjacent each other,
accommodating said connecting element of said pelt board in one of said apertures of said top plate,
moving said lifting device to a second position in which said top plate and said bottom plate are distant each
other, and
introducing gas, preferably air, into said inner space for causing said gas to flow into said pelt board via said
one aperture.

13. A method of drying a pelt by providing a drying unit, said drying unit defining:

a top plate having a number of apertures,
a bottom plate being parallel to and spaced apart from said top plate,
a gas inlet for receiving a stream of gas, preferably air, and
a sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing an inner
space between said top plate, said bottom plate, said gas inlet and said sidewall, said drying unit comprising a
flow distributor disposed within said inner space between said gas inlet and said top plate,

said method further comprising the steps of:

accommodating said pelt on an elongated hollow pelt board having a pelt board top, a pelt board bottom and
a connecting element at said pelt board bottom,
accommodating said connecting element of said pelt board in one of said apertures of said top plate, and
introducing gas, preferably air, into said inner space for causing said gas to flow into said pelt board via said
one aperture.

14. A pelt processing system comprising:

a tanning unit for tanning a pelt which has been fixated to an expanded pelt board having a pelt board top, a pelt board bottom and a connecting element at said pelt board bottom, said pelt board further being operable between an expanded state and a non-expanded state by moving said connecting element relative to said pelt board bottom,

a holding unit for accommodating a plurality of said elongated hollow pelt boards, said holding unit defining a top plate having a number of apertures, each of said apertures being adapted for accommodating said connecting element,

a blowing unit compatible with said holding unit and comprising a bottom plate being parallel to and spaced apart from said top plate, a gas inlet for receiving a stream of gas, preferably air, and a sidewall for interconnecting with said top plate in a fluid-tight manner for establishing an inner space between said top plate, said bottom plate, said gas inlet and said sidewall, and

a release mechanism for causing said pelt boards on said holding unit to assume said non-expanded state.

15. A method of drying a pelt by providing a drying system, said drying system comprising:

a tanning unit for tanning a pelt which has been fixated to an expanded pelt board having a pelt board top, a pelt board bottom and a connecting element at said pelt board bottom,

a holding unit defining a top plate having a number of apertures, each of said apertures being adapted for accommodating said connecting element,

a blowing unit compatible with said holding unit and comprising a bottom plate being parallel to and spaced apart from said top plate, a gas inlet for receiving a stream of gas, preferably air, and a sidewall interconnecting said top plate and said bottom plate in a fluid-tight manner for establishing an inner space between said top plate, said bottom plate, said gas inlet and said sidewall, and

a release mechanism for causing said pelt board on said holding unit to assume said non-expanded state.

said method further comprising the steps of:

providing a pelt board, said pelt board having a pelt board top, a pelt board bottom and a connecting element at said pelt board bottom, said pelt board further being adjustable between an expanded state and a non-expanded state by operating said connecting element,

accommodating said pelt on said elongated hollow pelt board being in said expanded state,

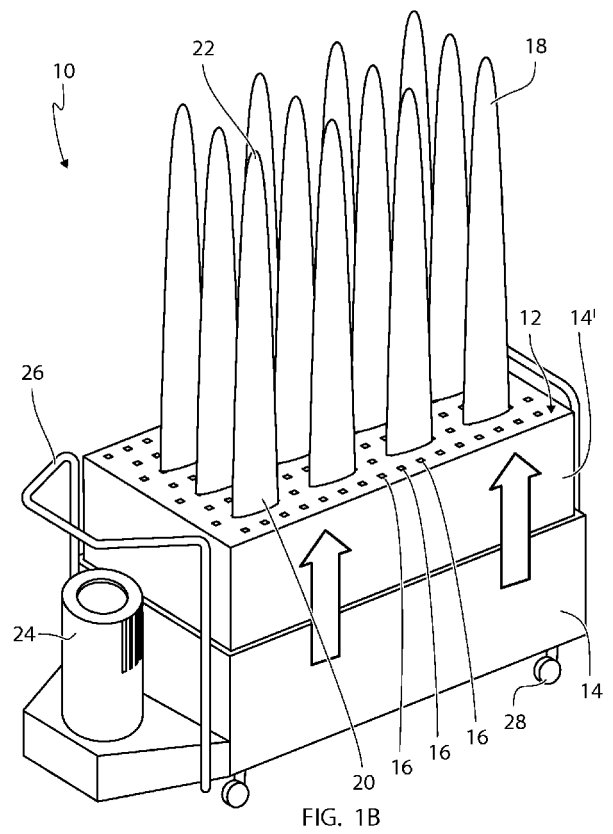
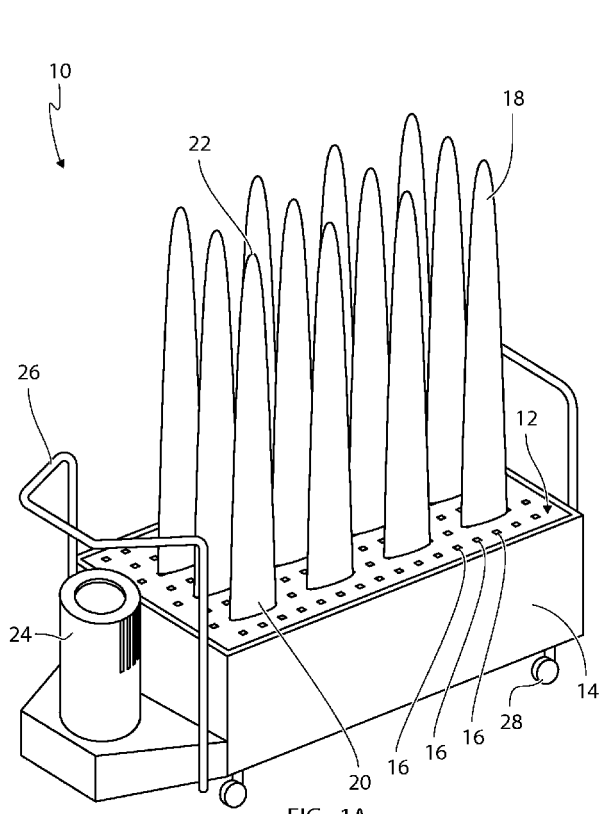
accommodating said connecting element of said pelt board in one of said apertures of said top plate,

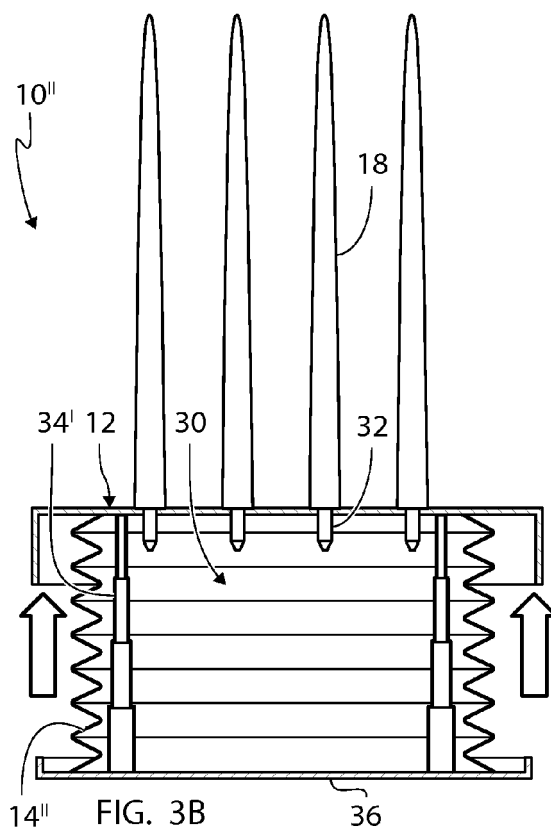
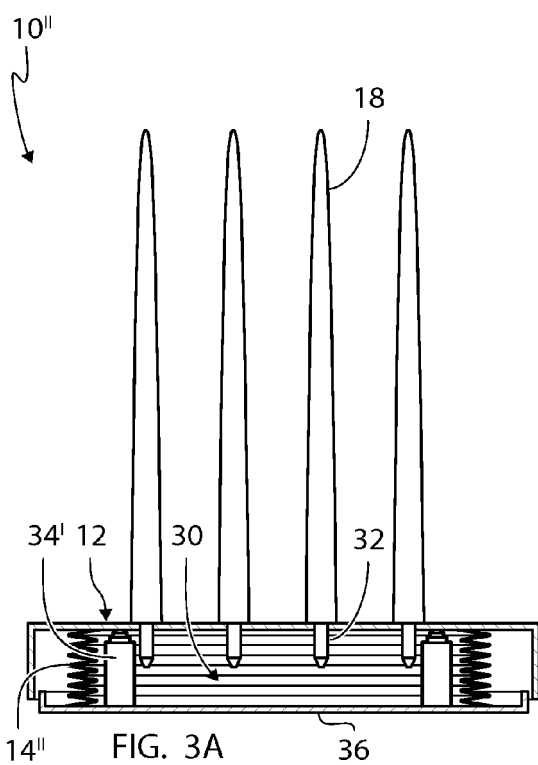
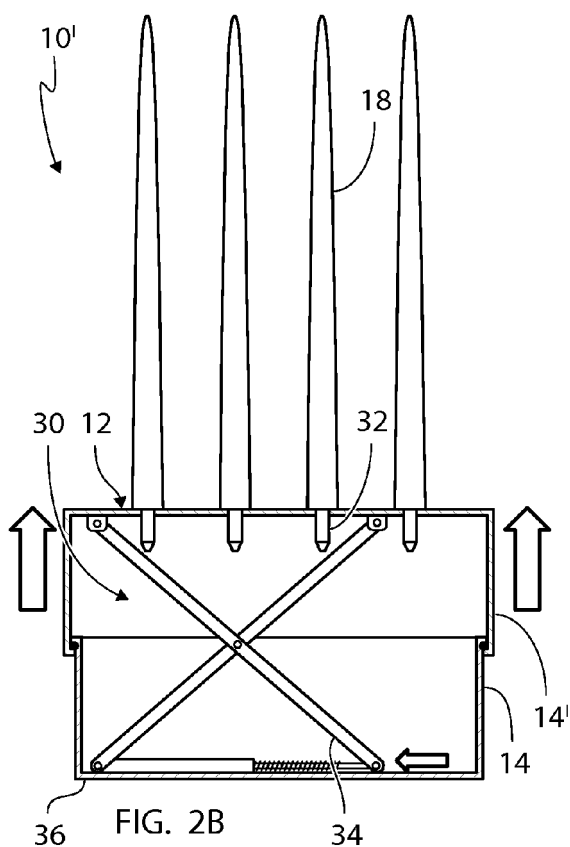
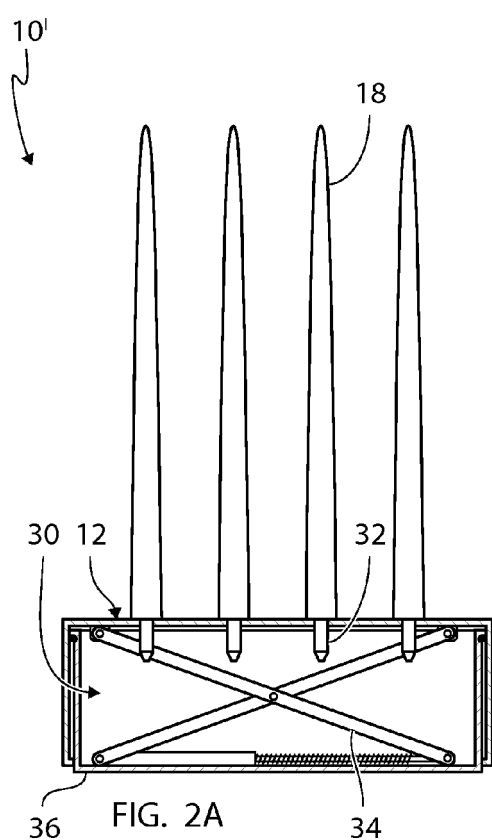
interconnecting said holding unit and said blowing unit by optionally lifting said holding unit,

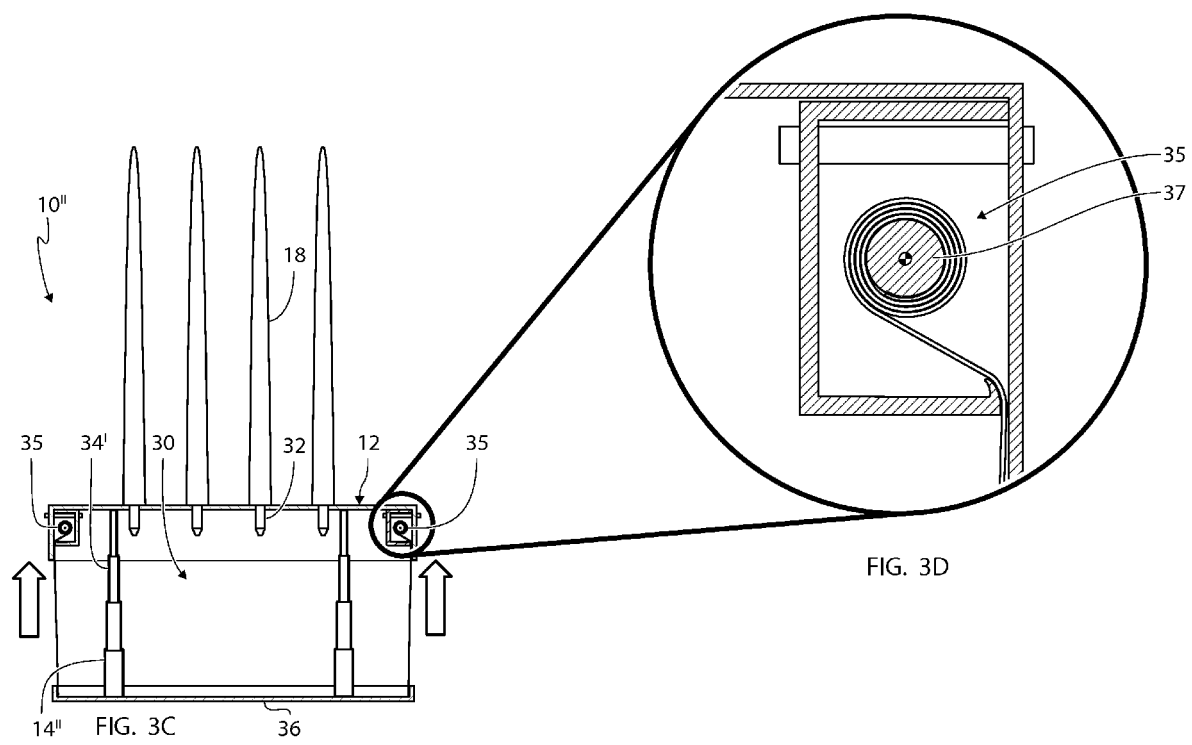
introducing gas, preferably air, into said inner space for causing said gas to flow into said pelt board via said one aperture,

disconnecting said holding unit and said blowing unit, and

operating said release mechanism thereby causing said pelt board to assume said non-expanded state.







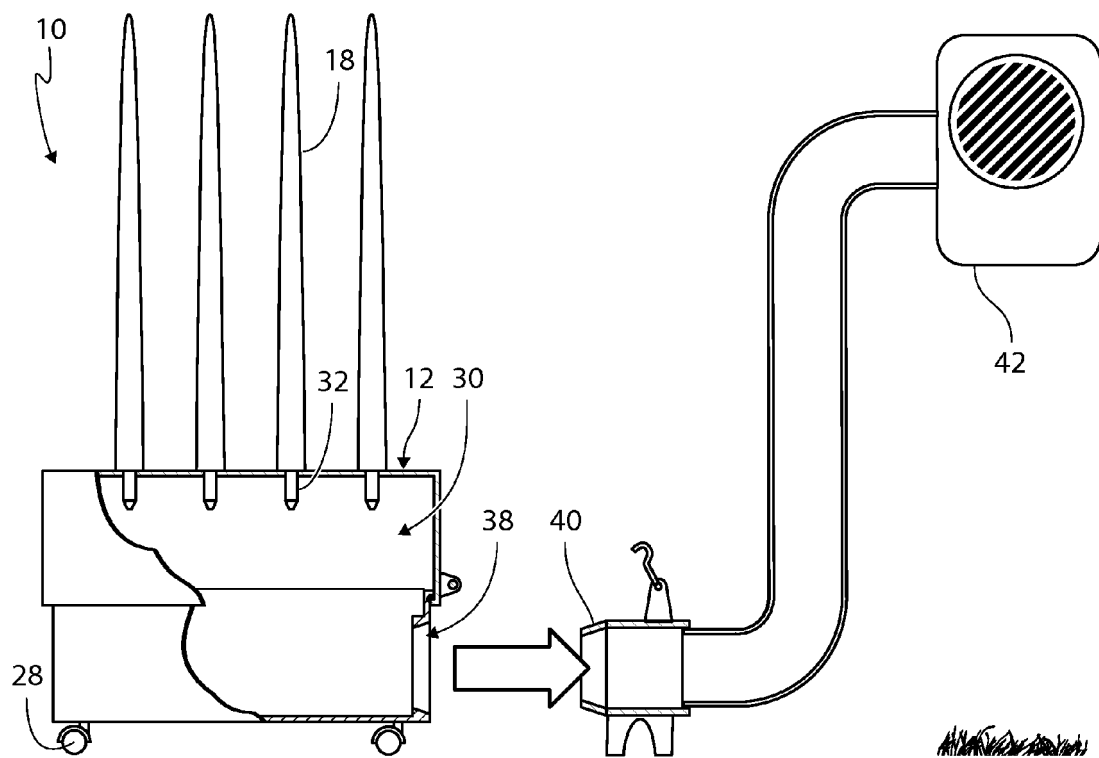


FIG. 4A

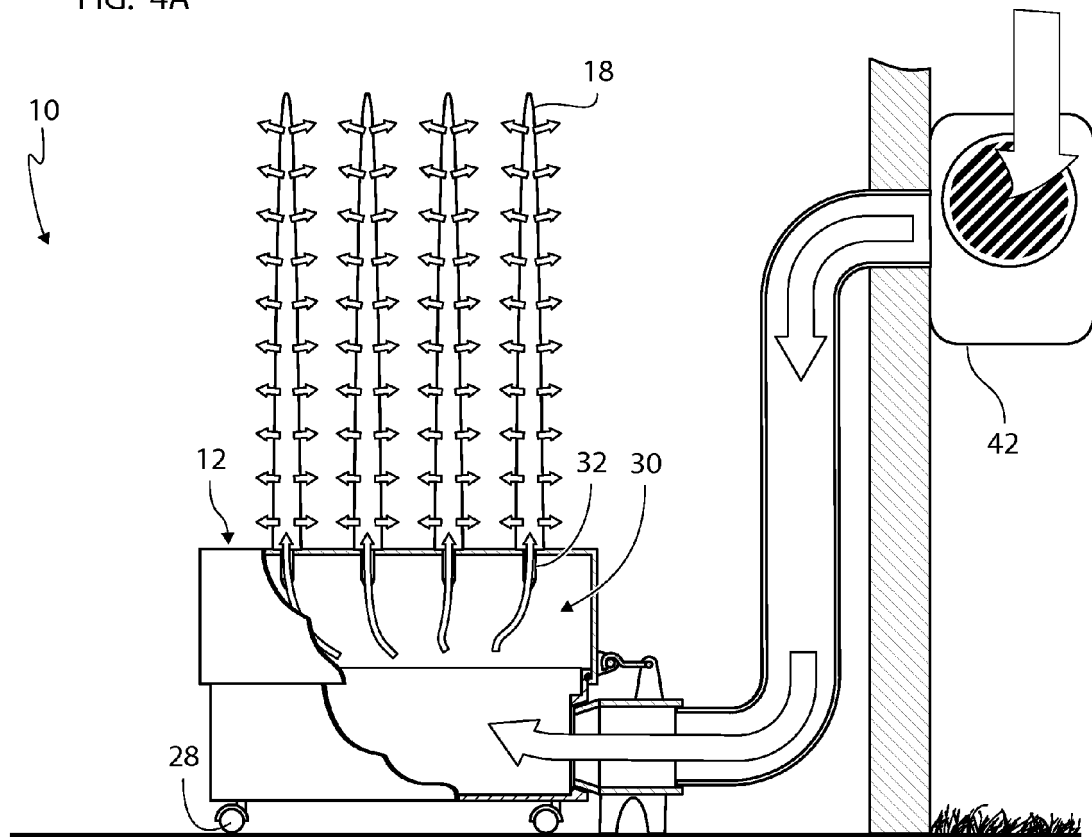
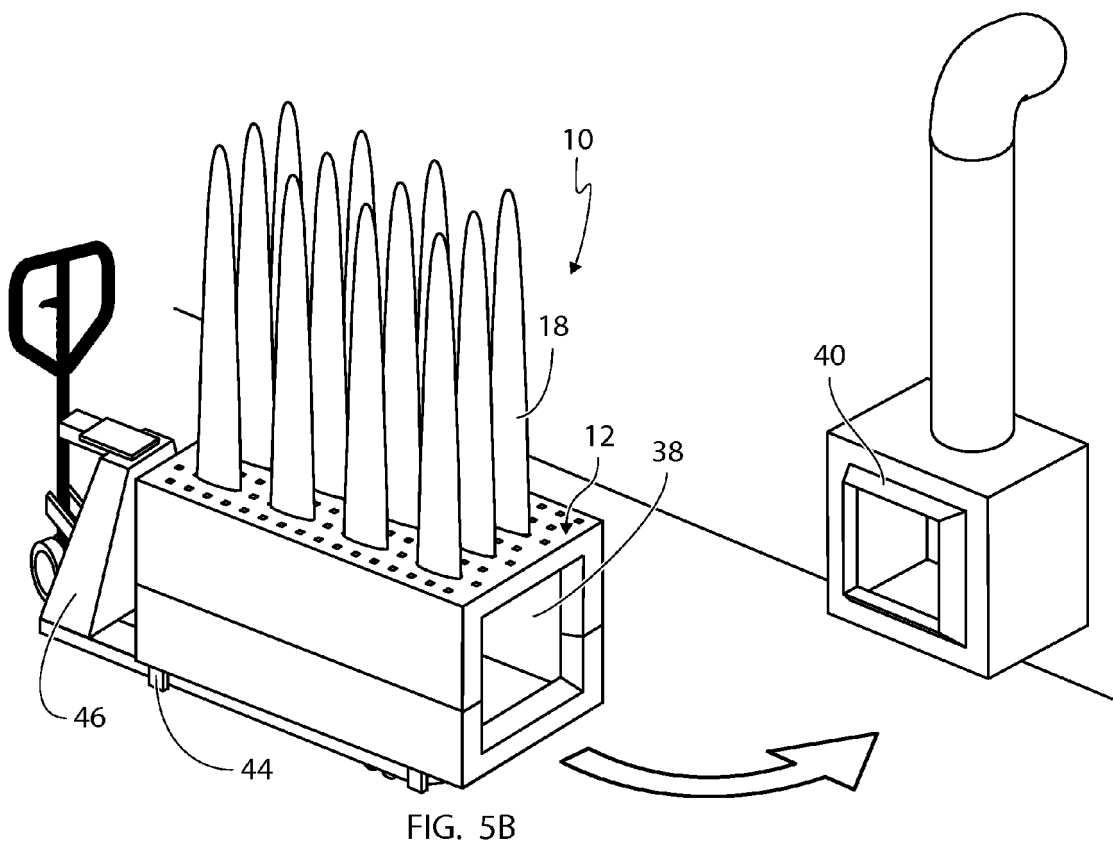
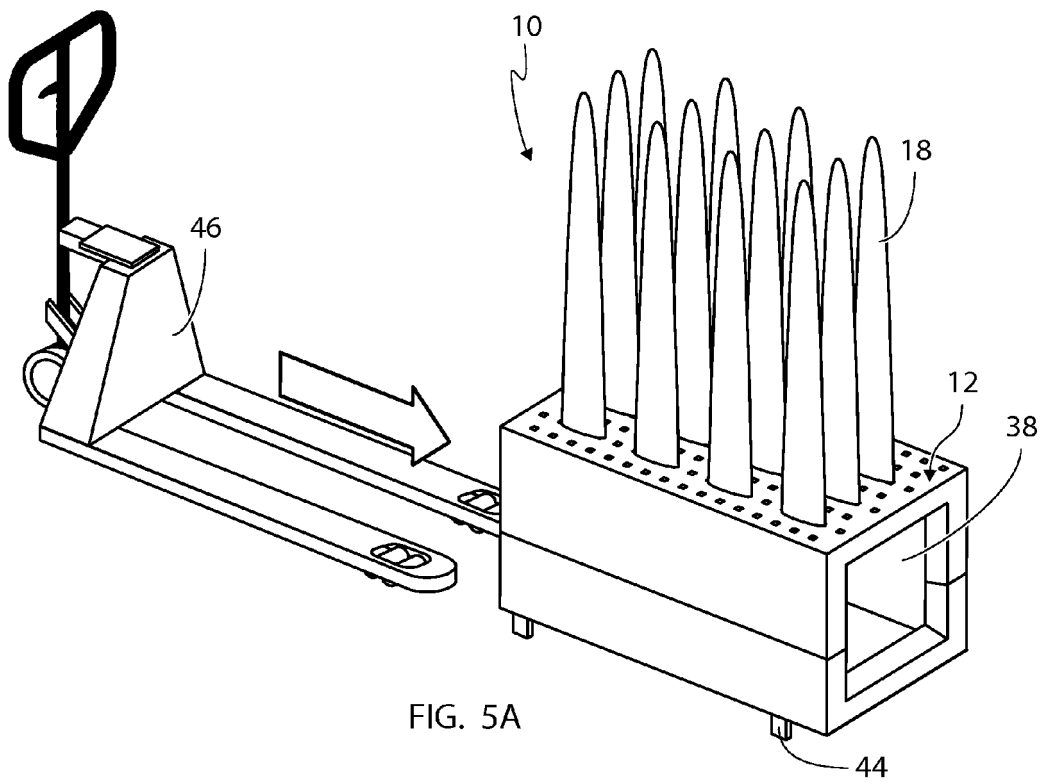


FIG. 4B



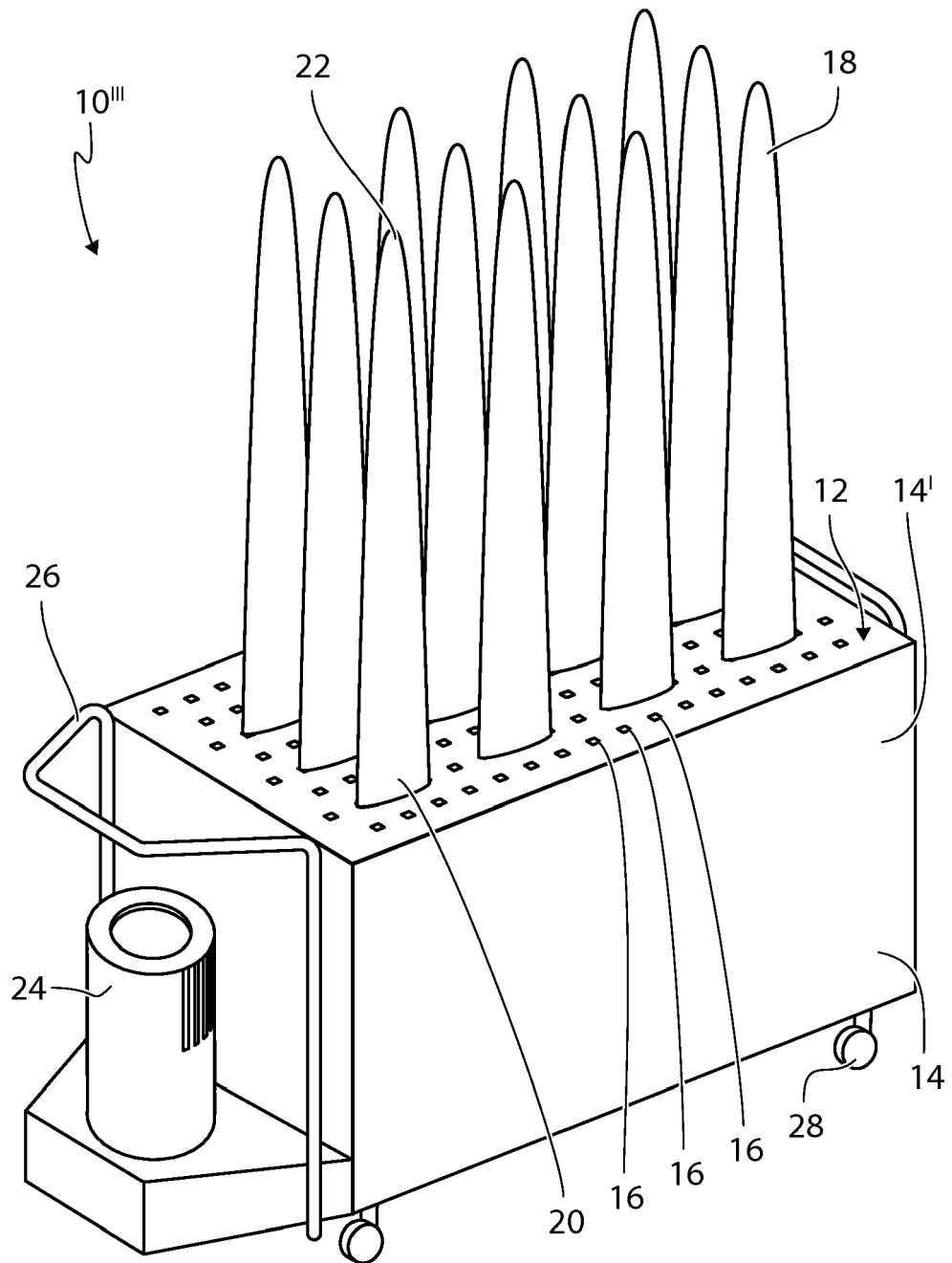
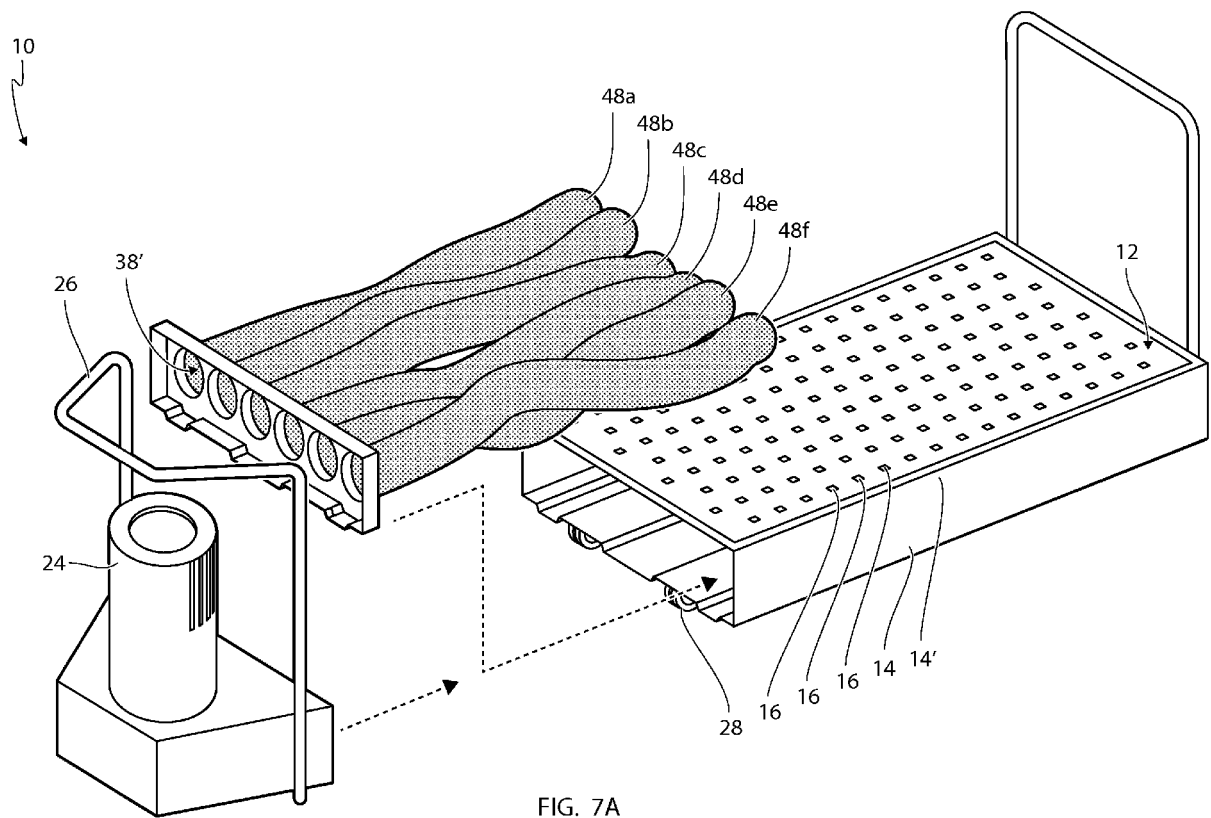
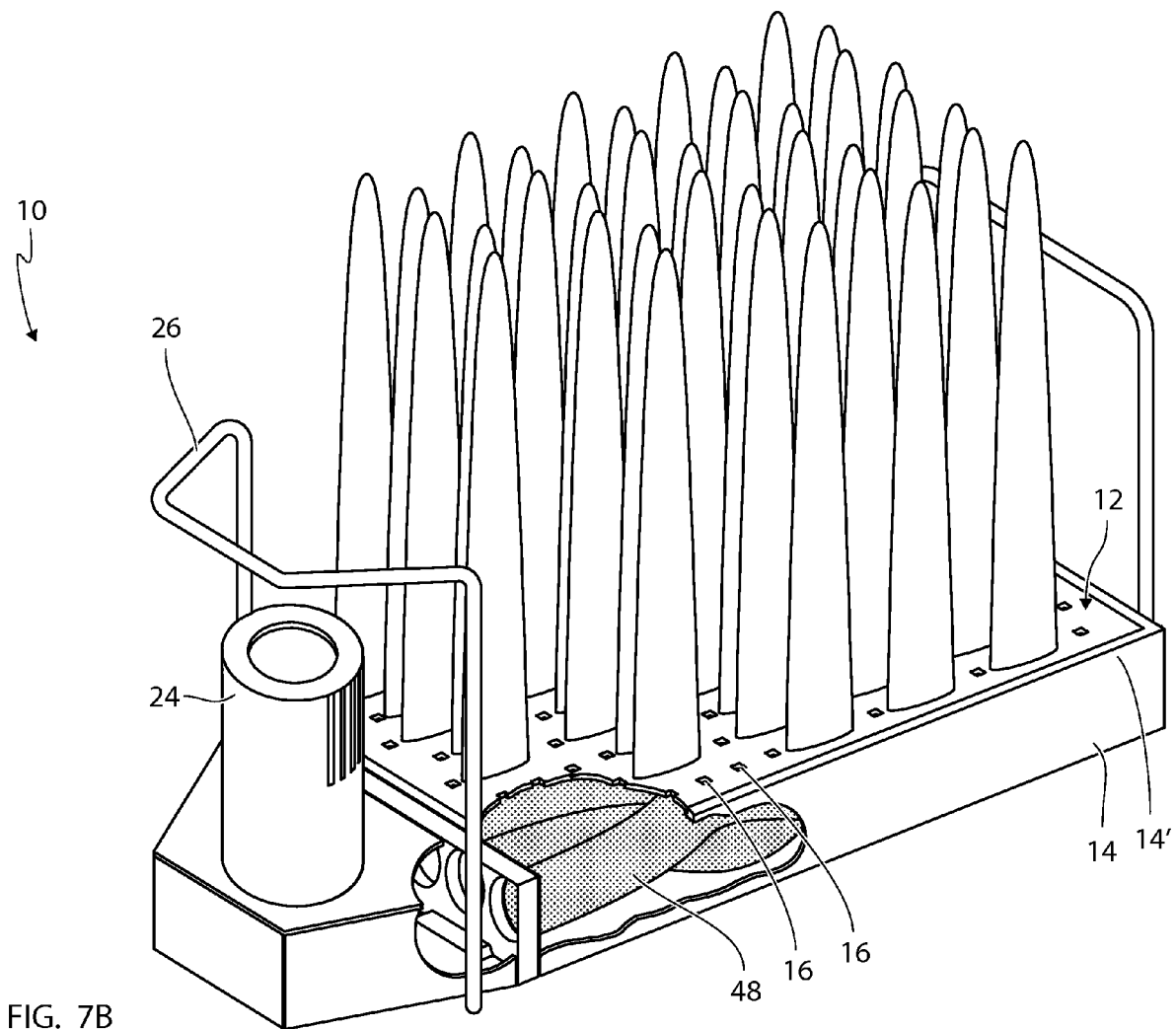
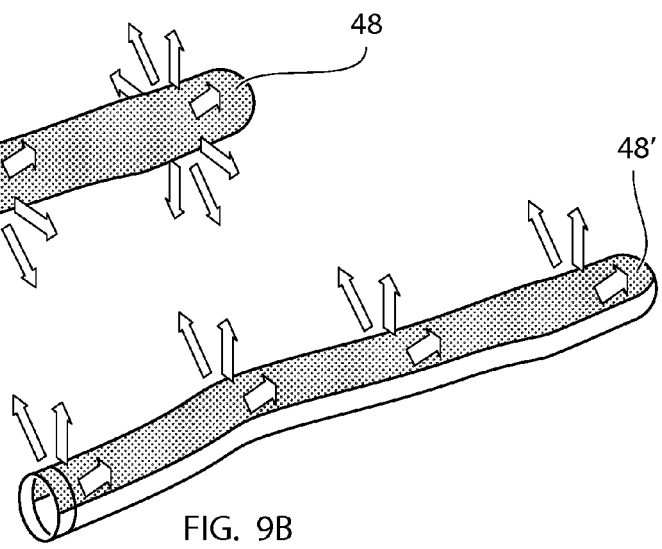
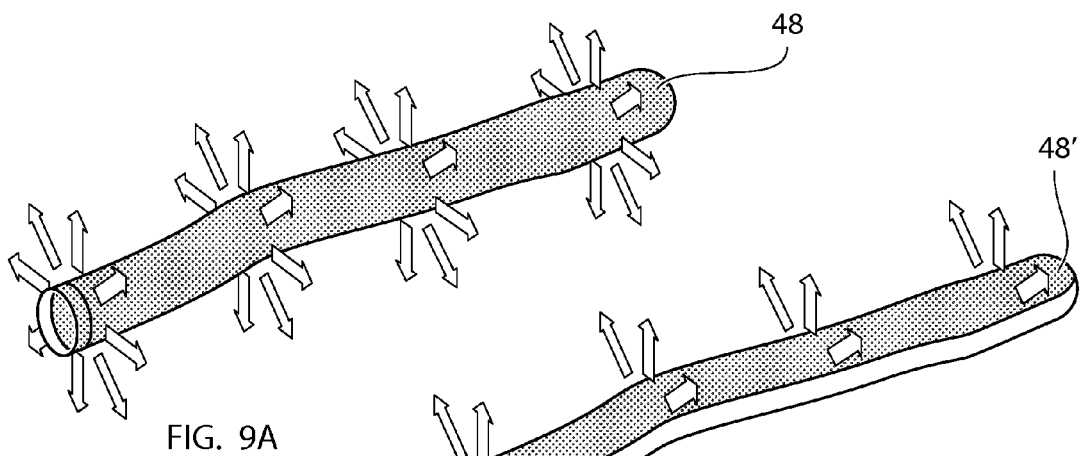
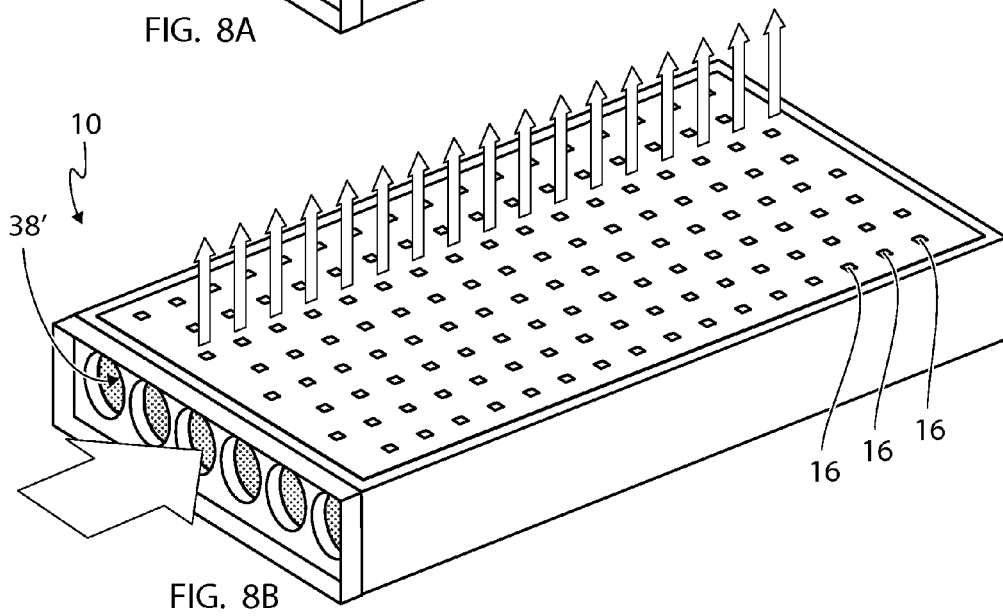
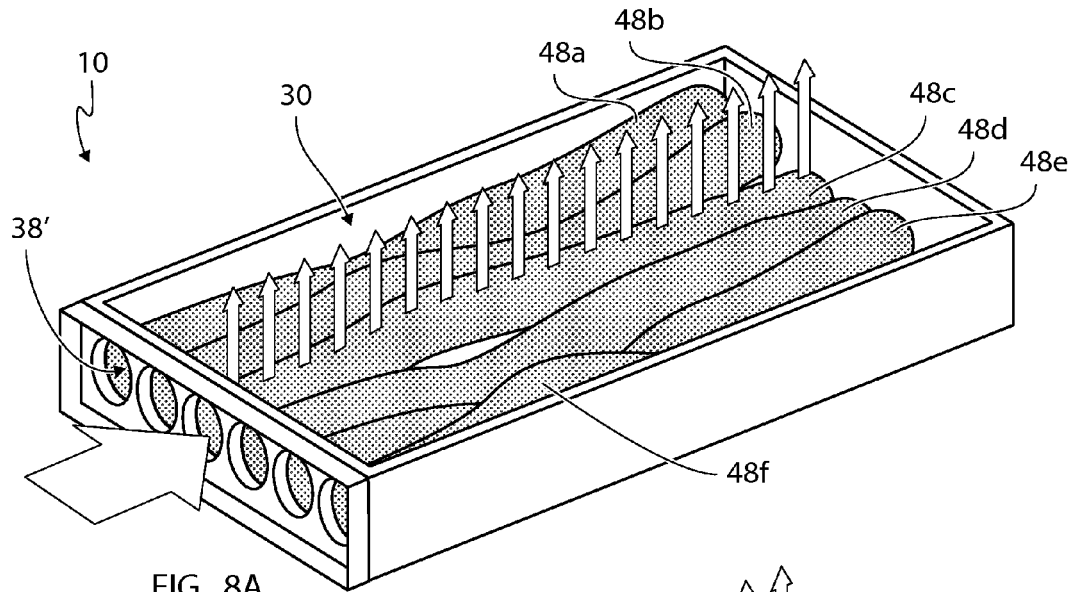
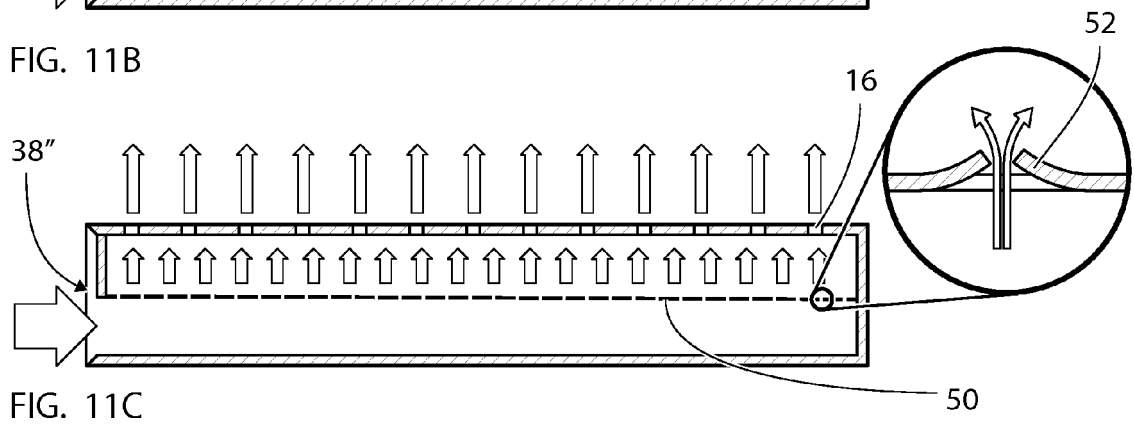
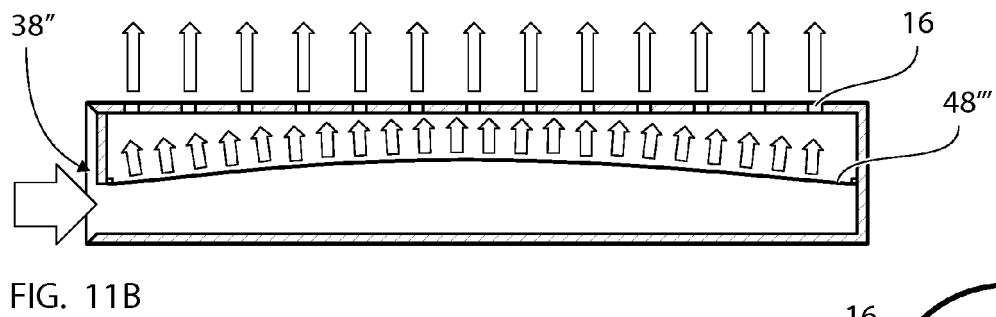
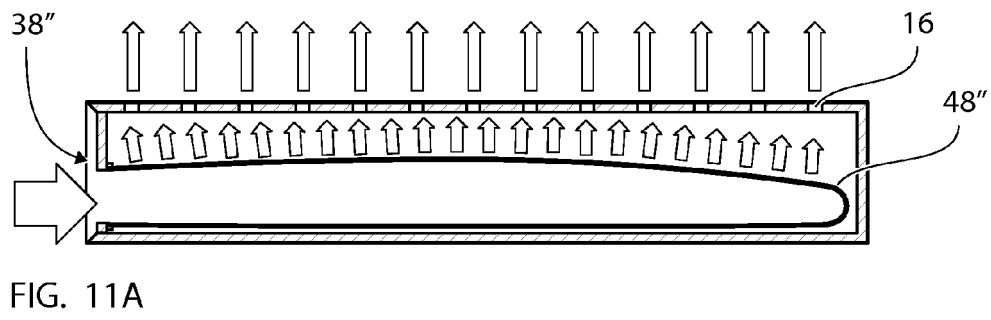
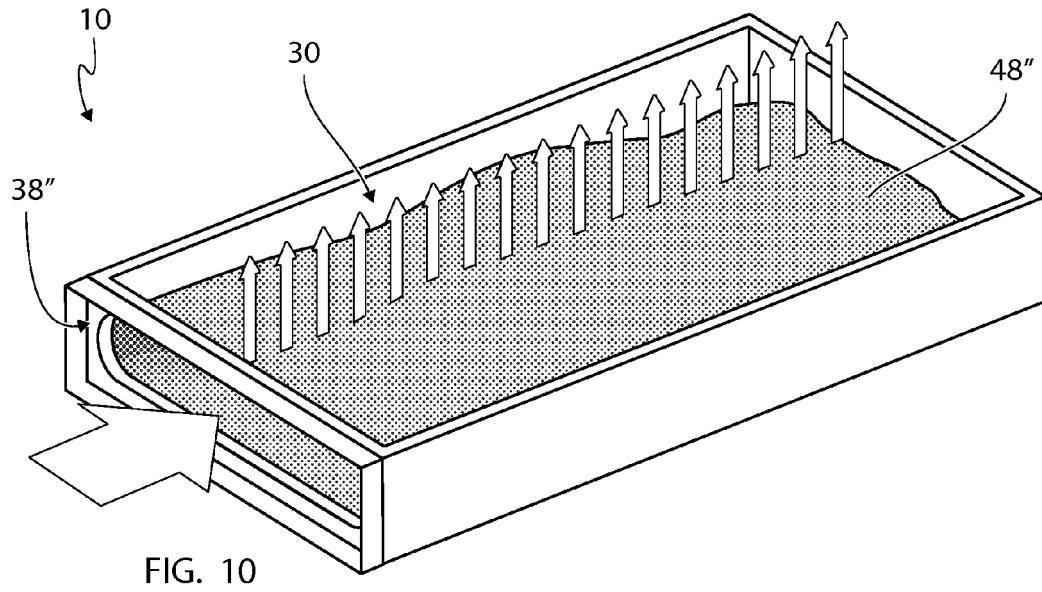


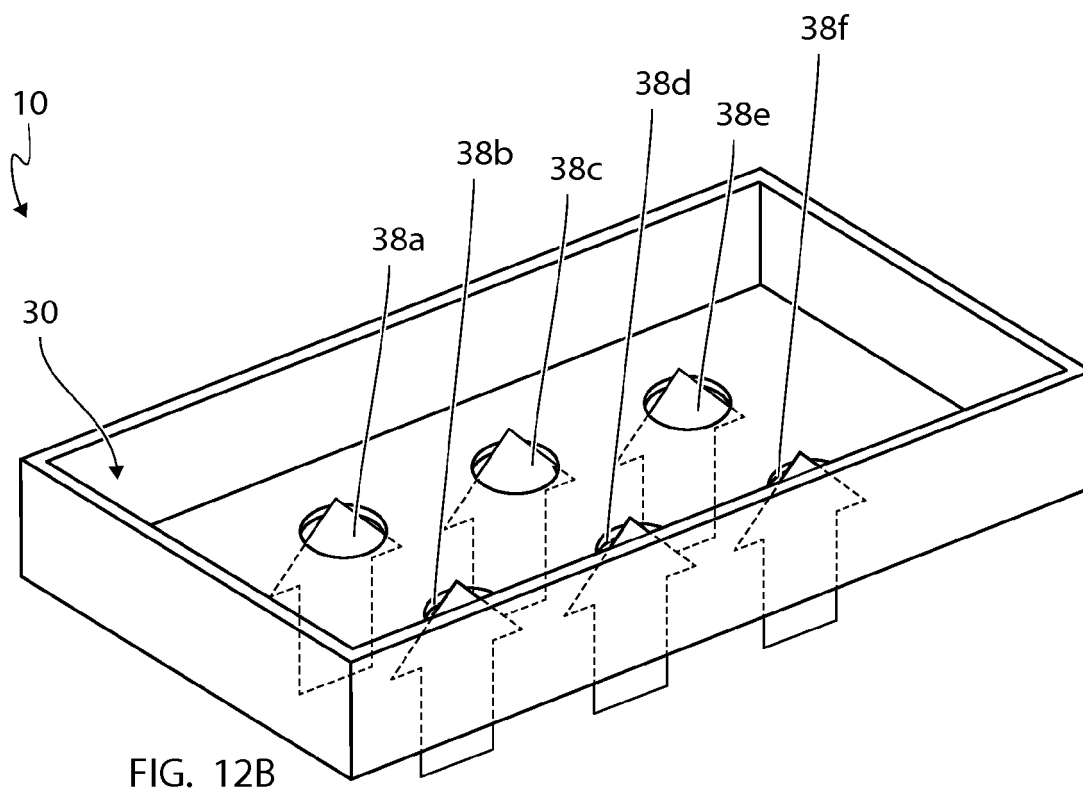
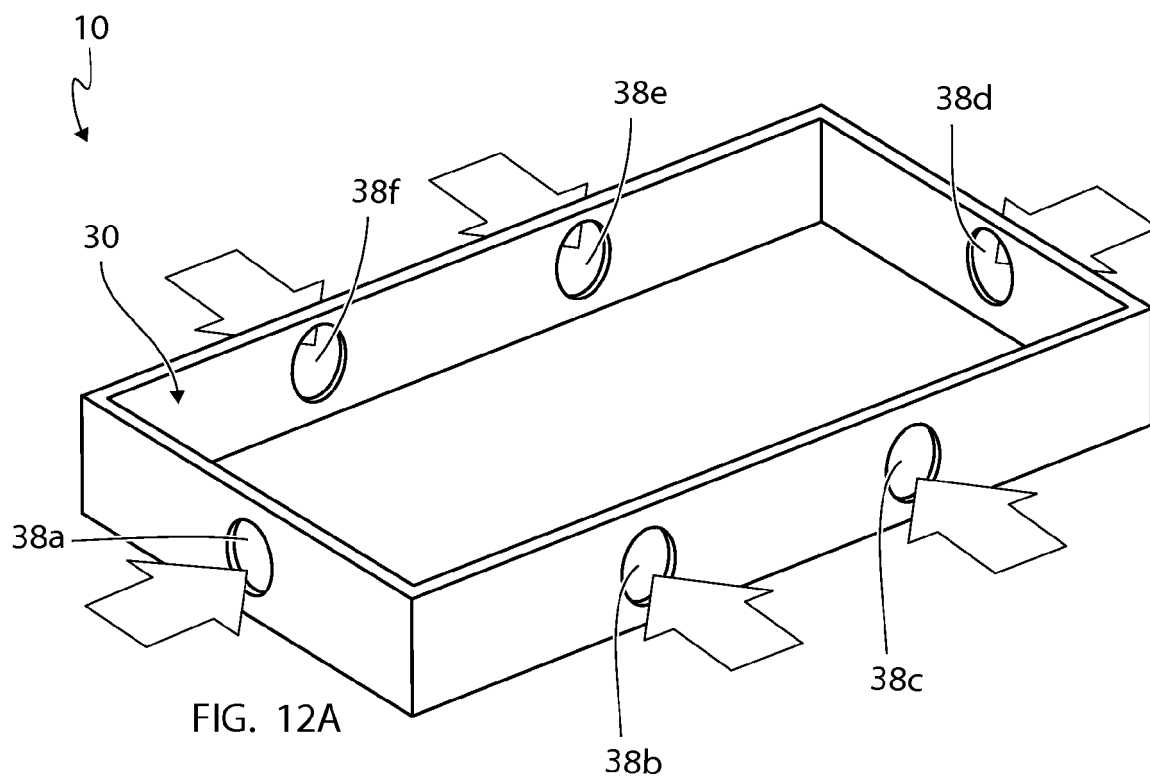
FIG. 6











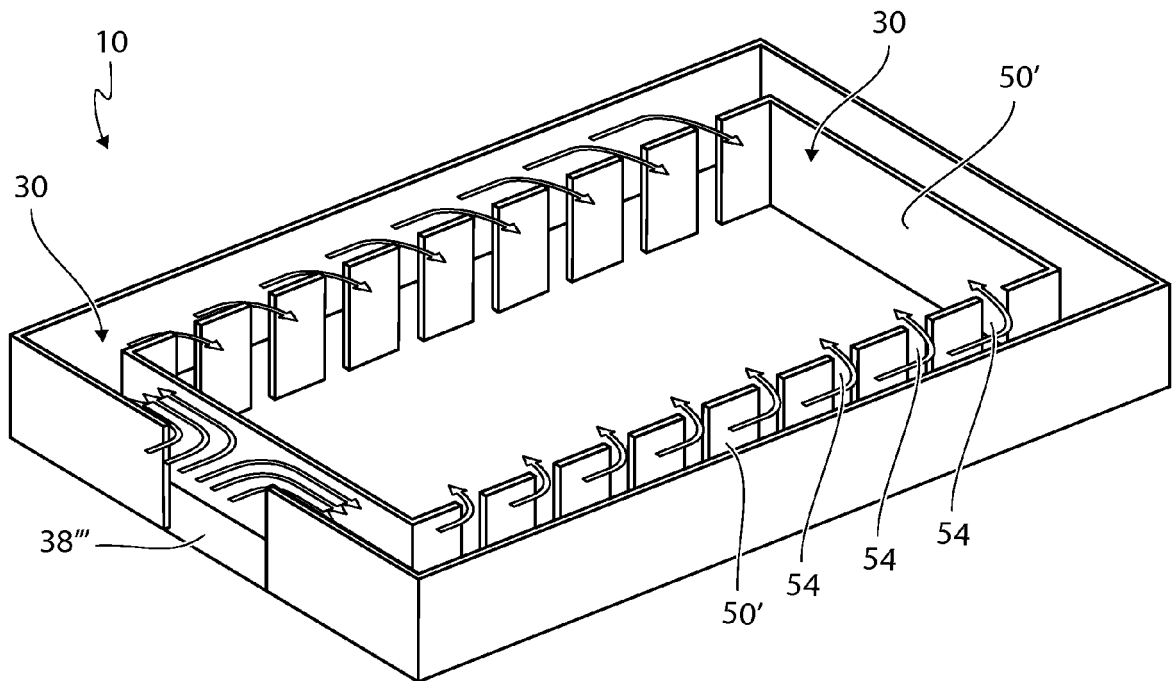


FIG. 13A

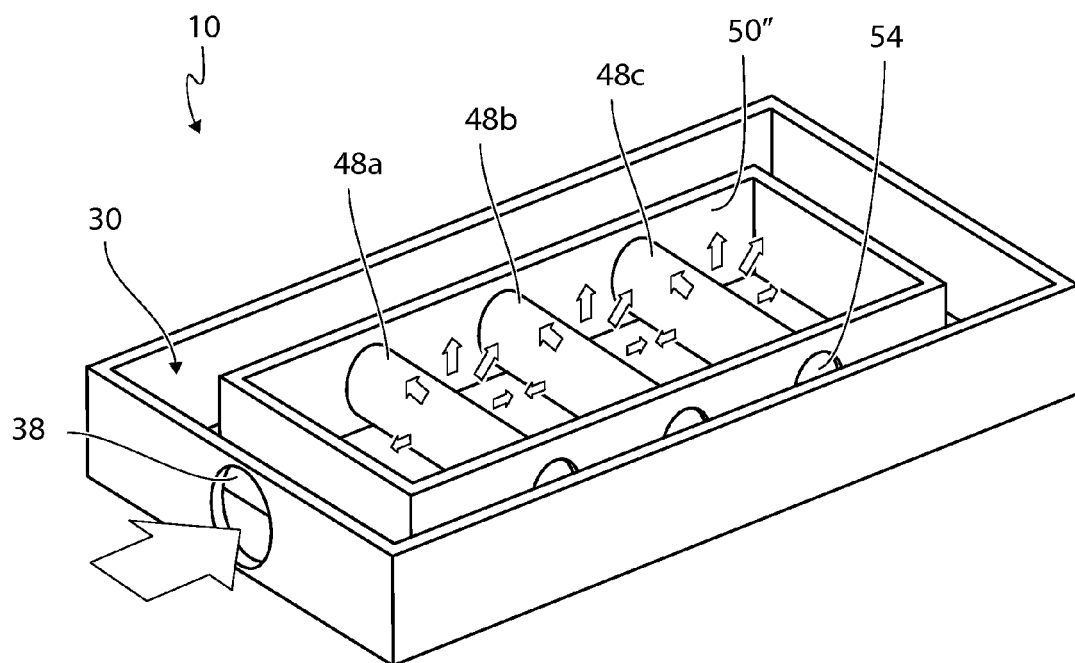


FIG. 13B

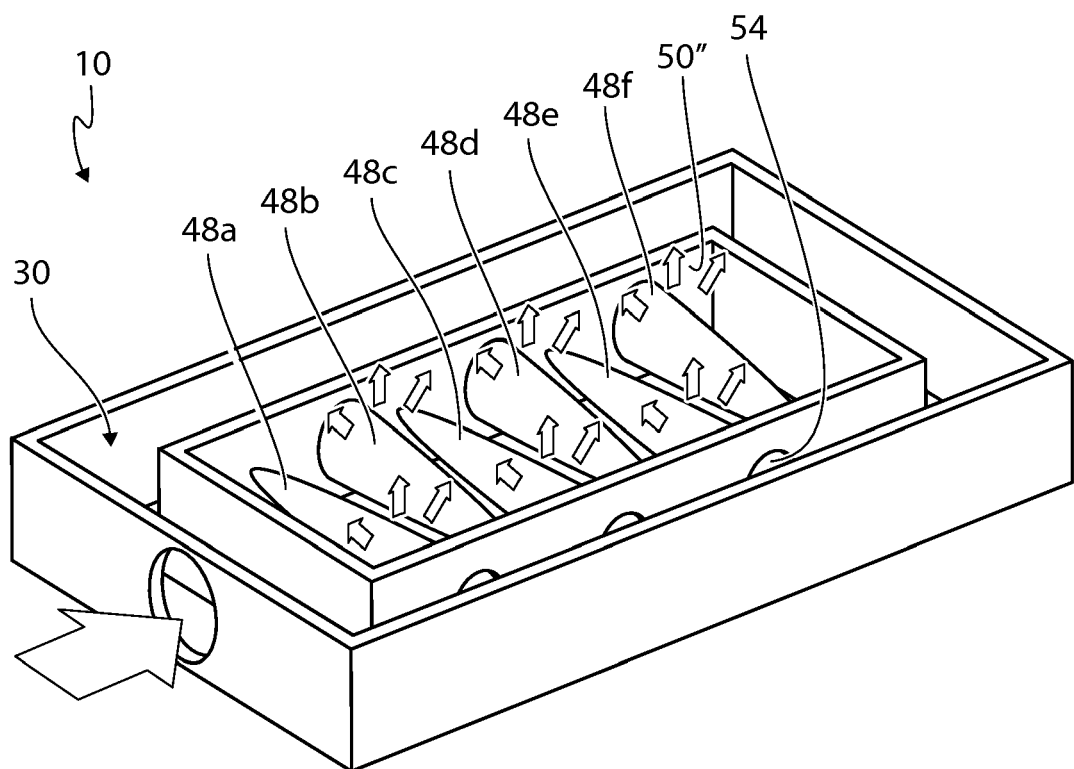


FIG. 13B

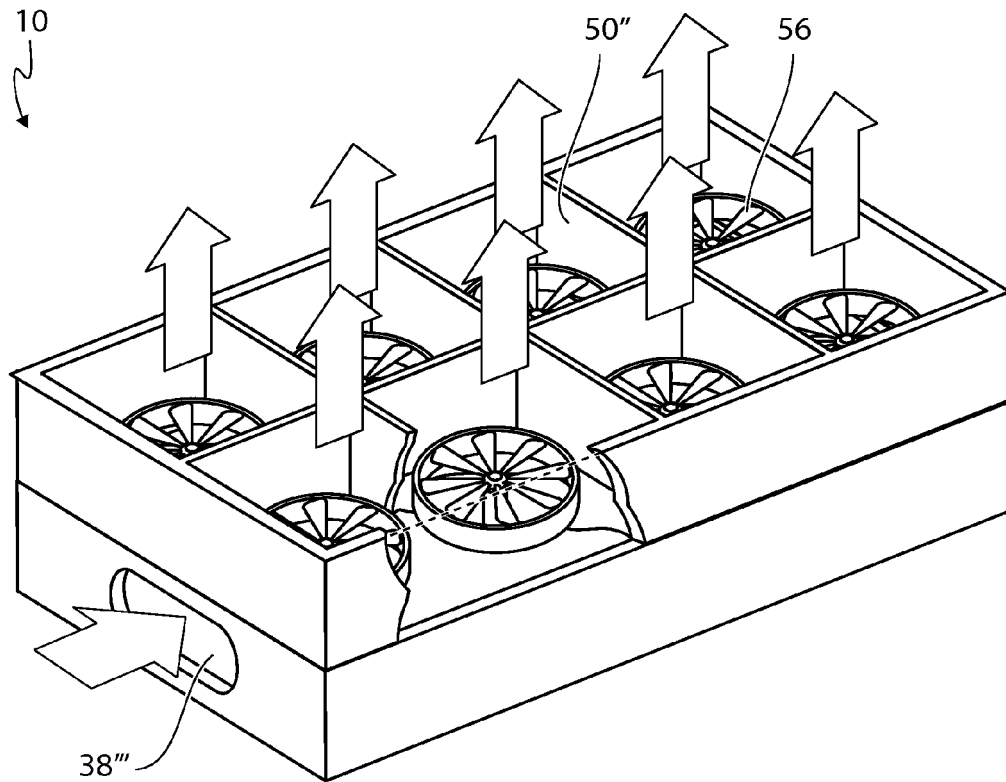


FIG. 14A

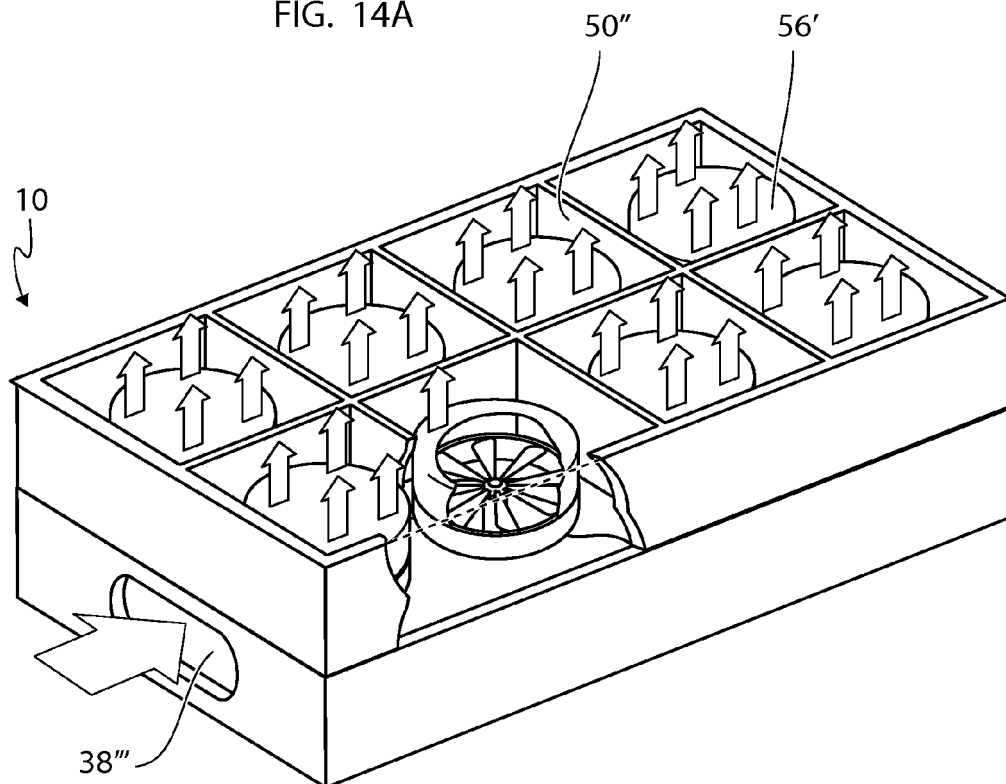


FIG. 14B

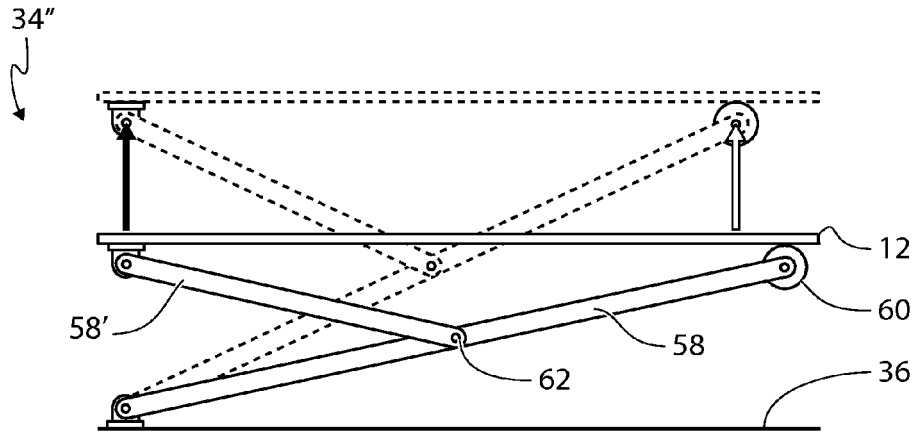


FIG. 15

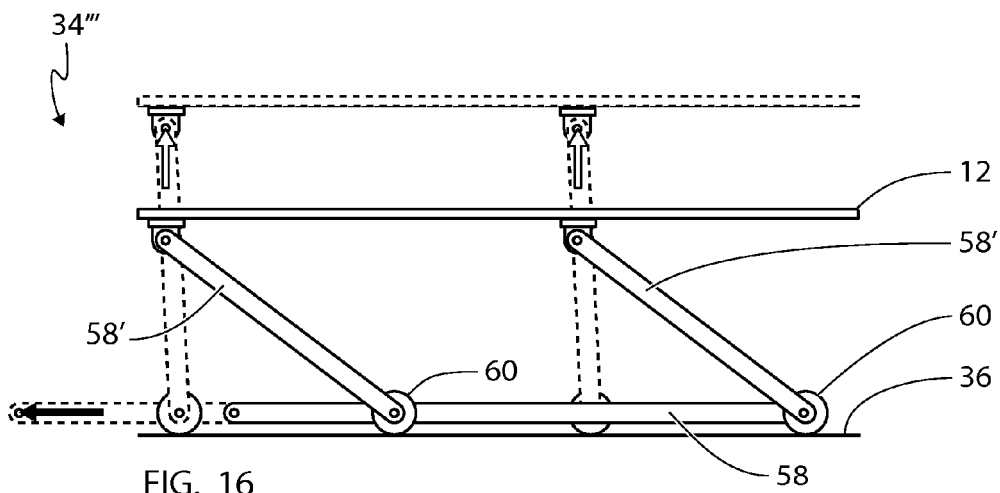


FIG. 16

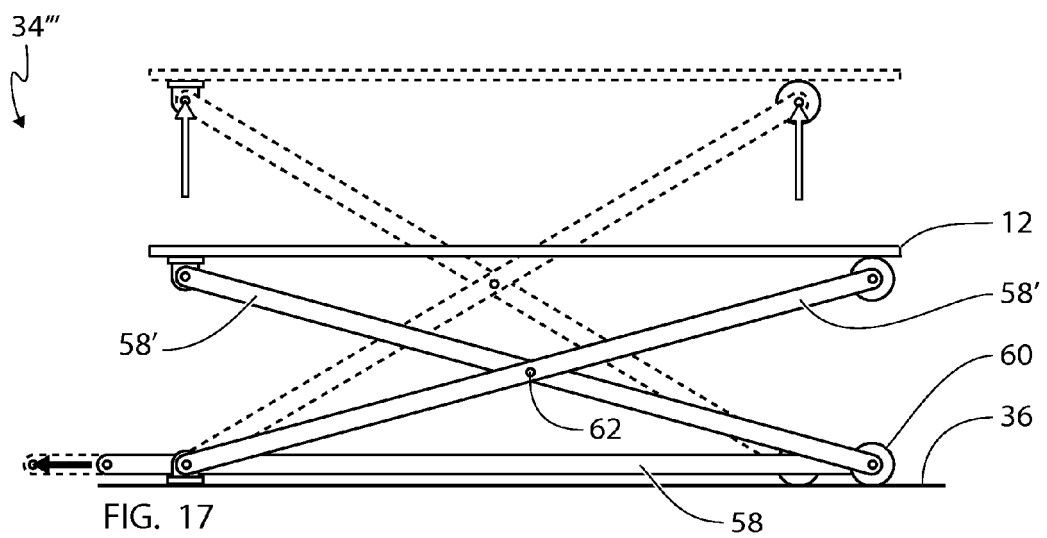


FIG. 17

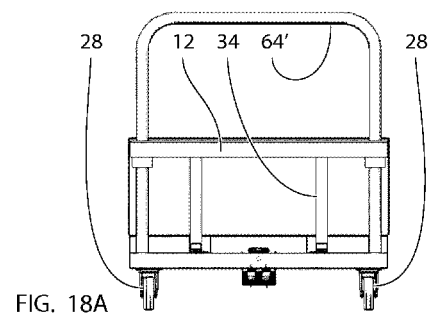
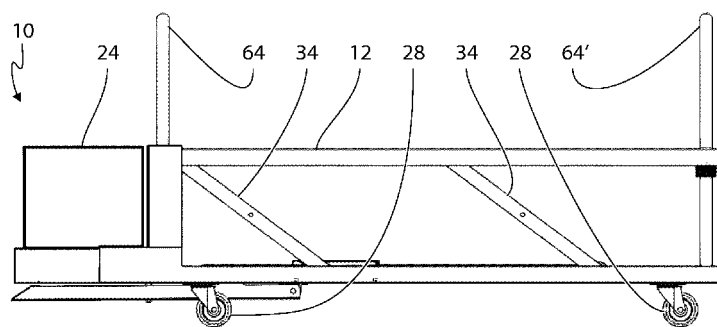


FIG. 18A

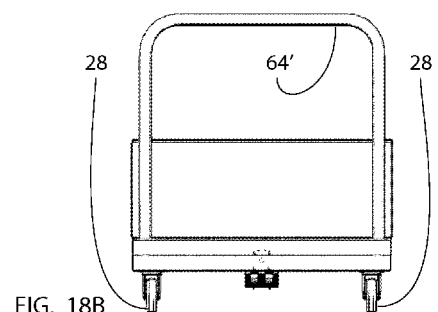
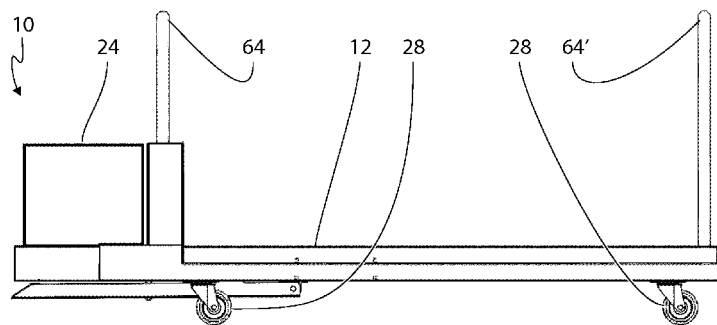
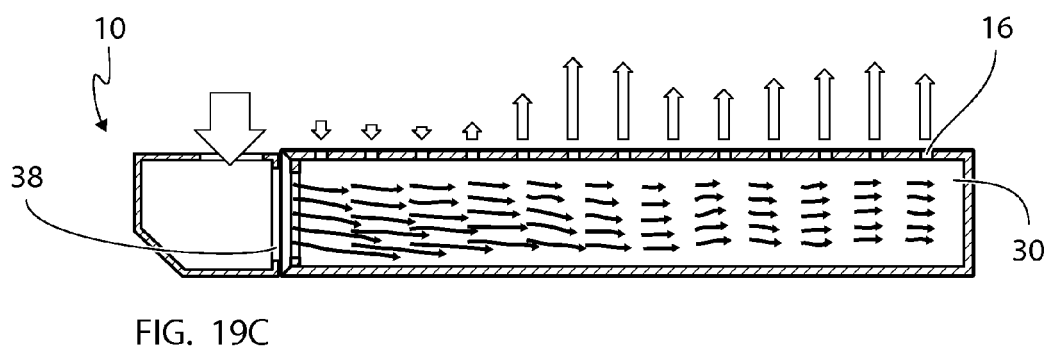
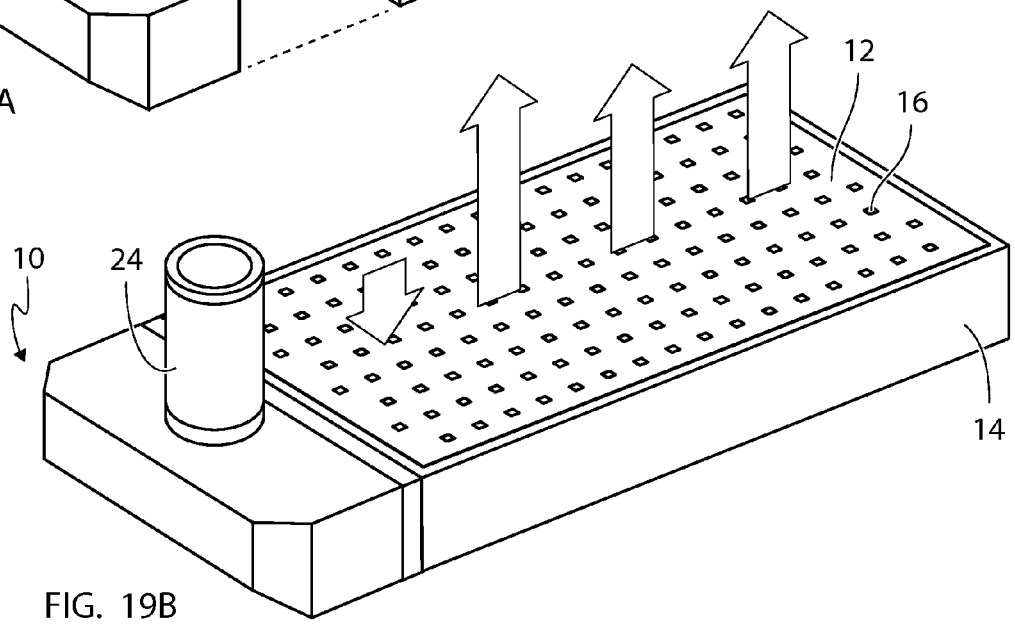
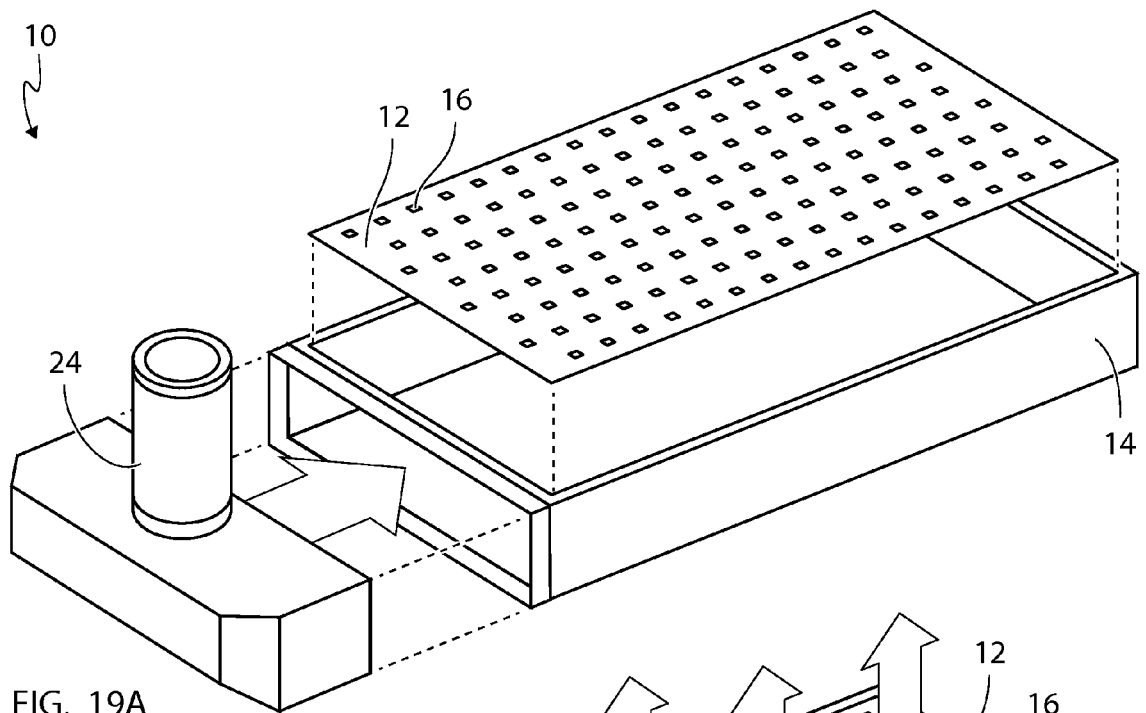


FIG. 18B



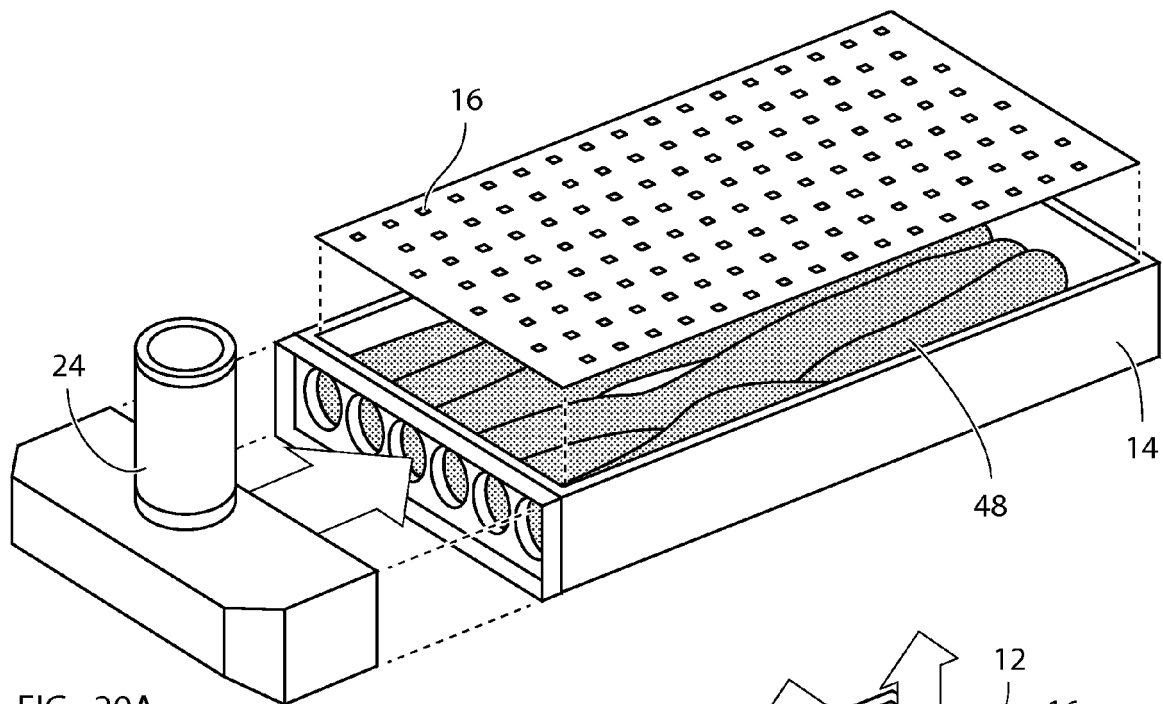


FIG. 20A

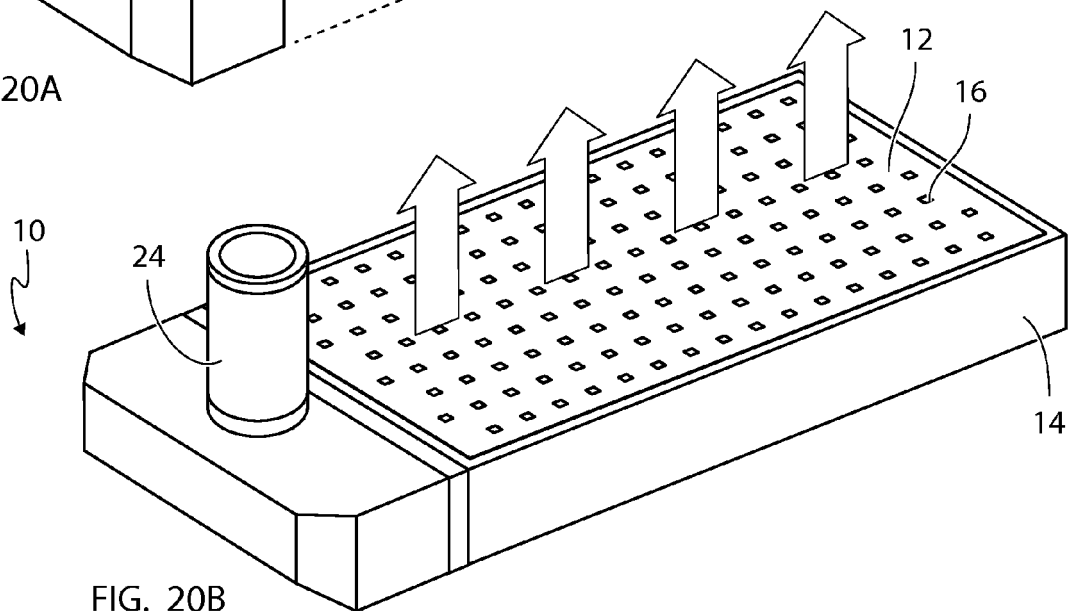


FIG. 20B

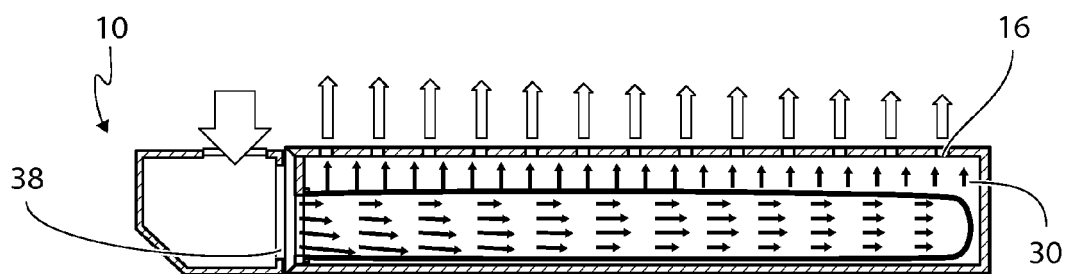


FIG. 20C

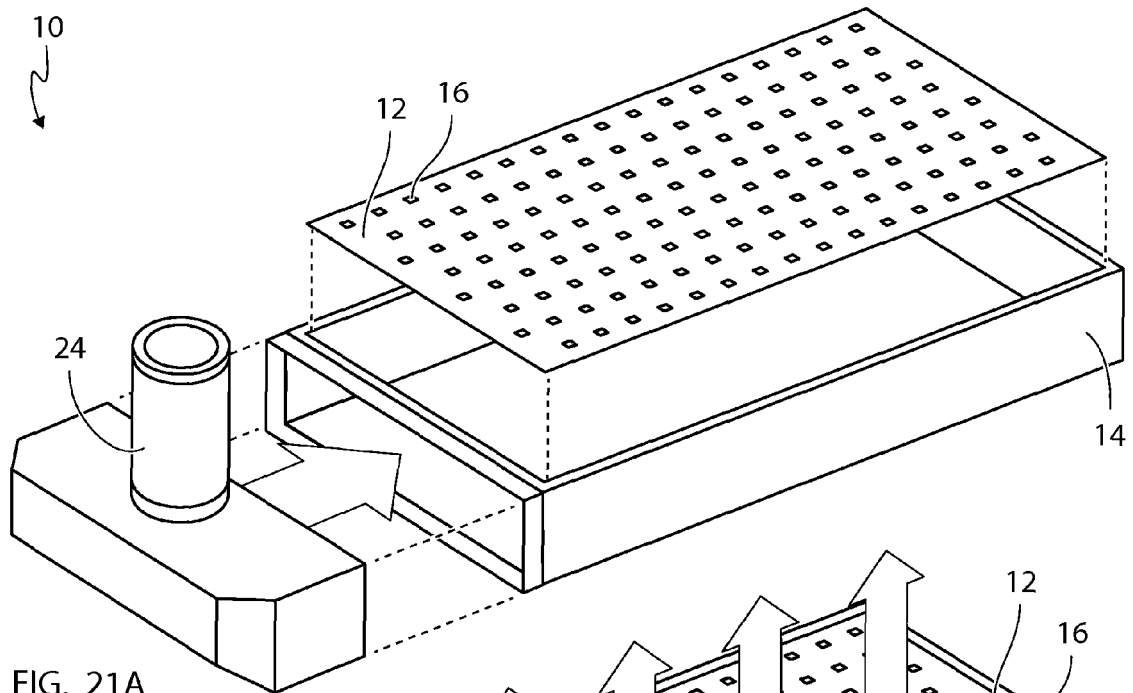


FIG. 21A

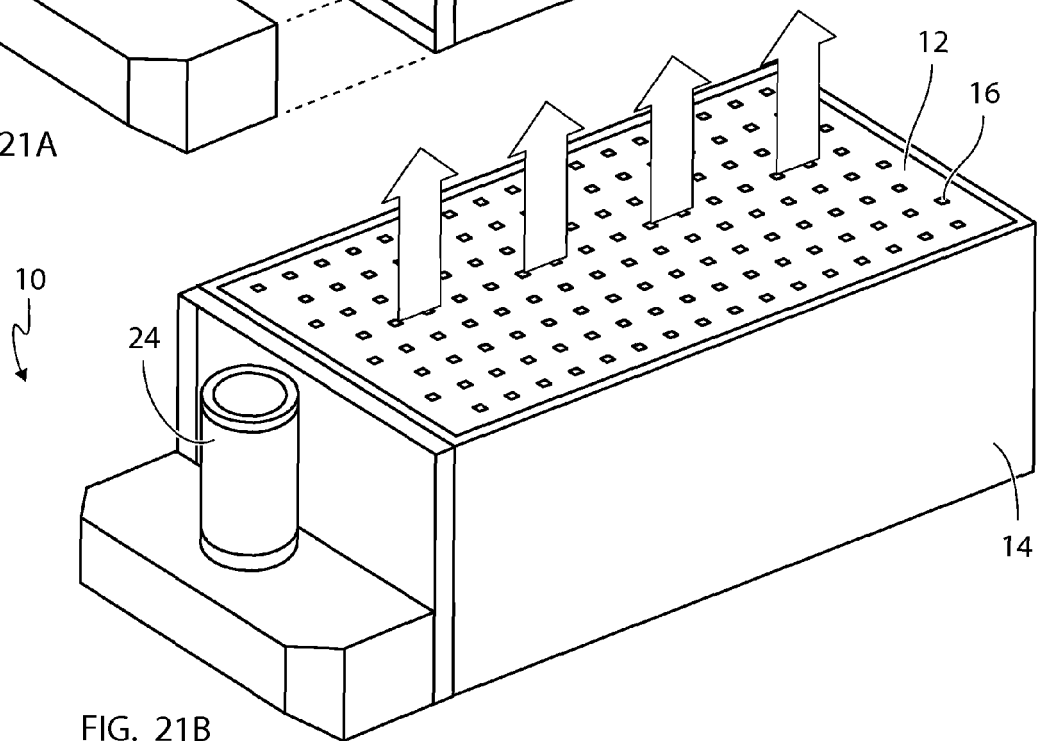


FIG. 21B

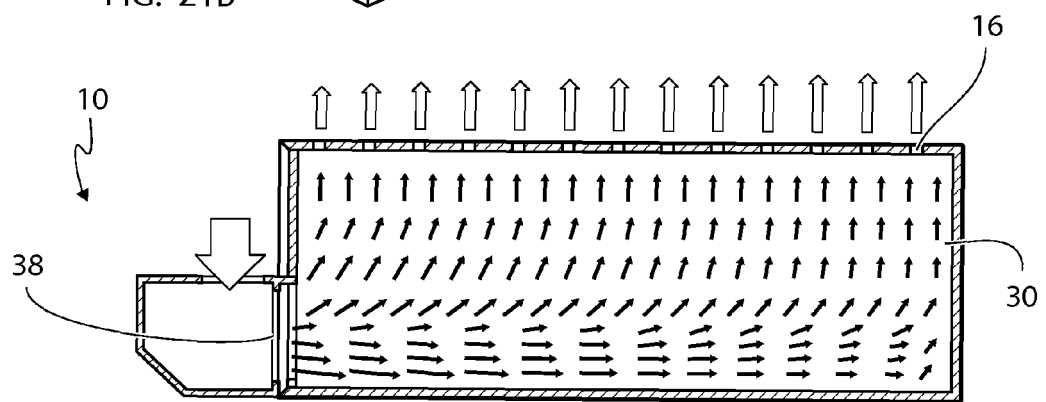


FIG. 21C

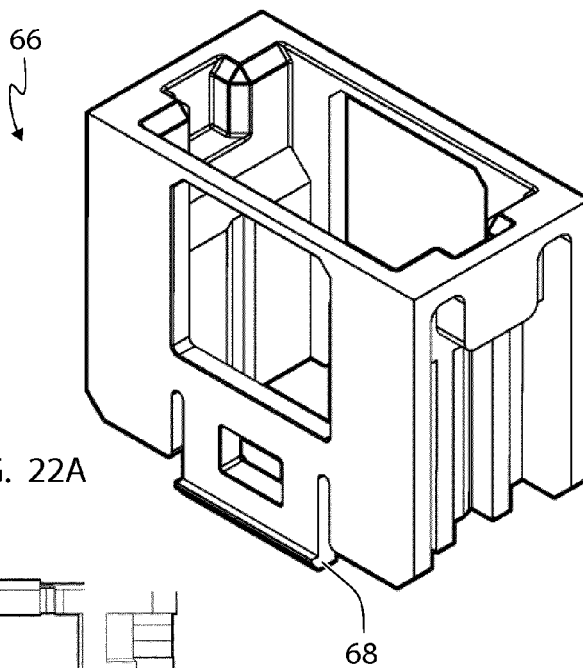


FIG. 22A

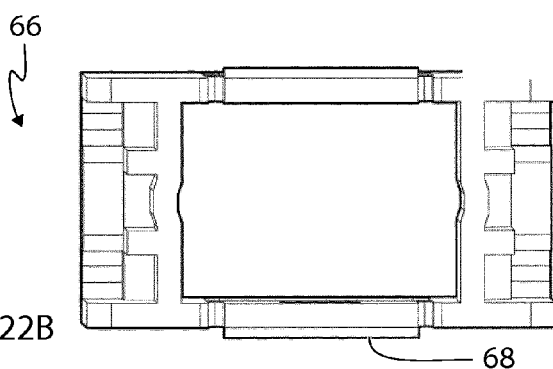


FIG. 22B

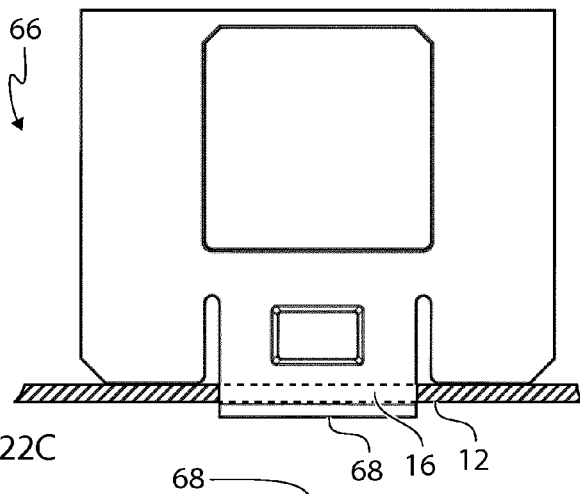


FIG. 22C

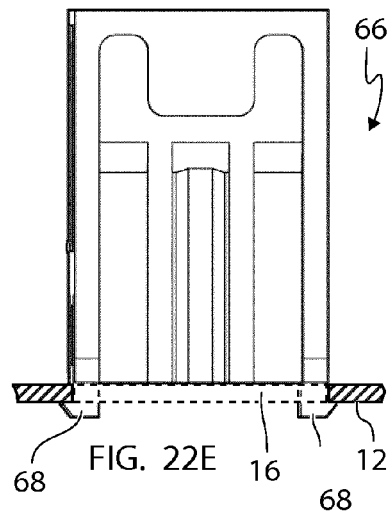


FIG. 22E

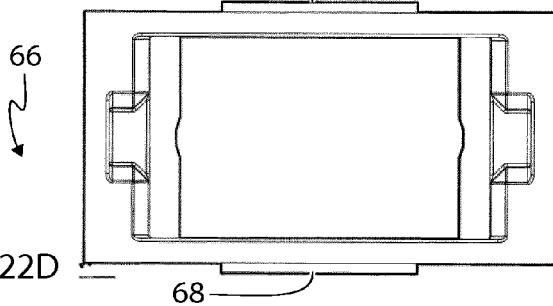
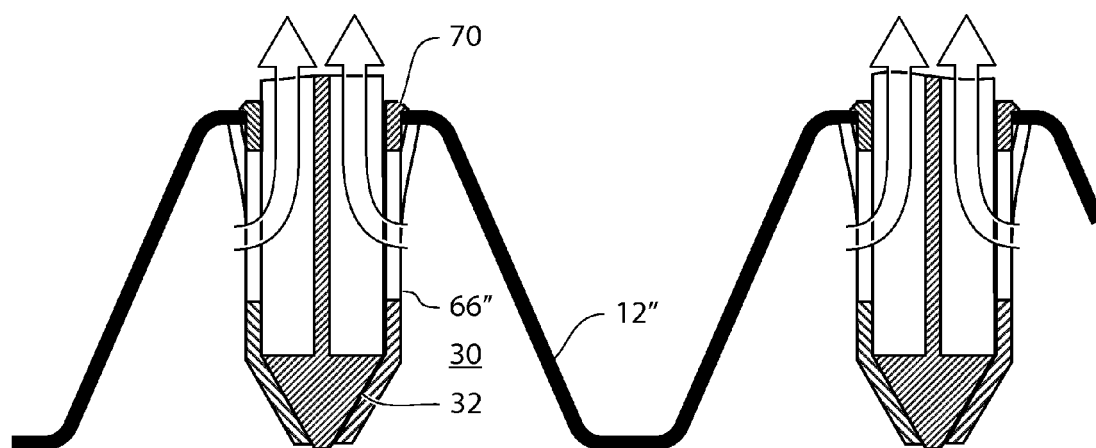
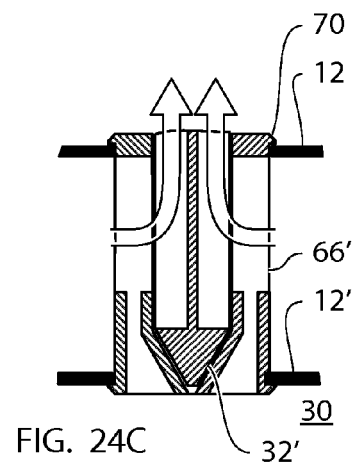
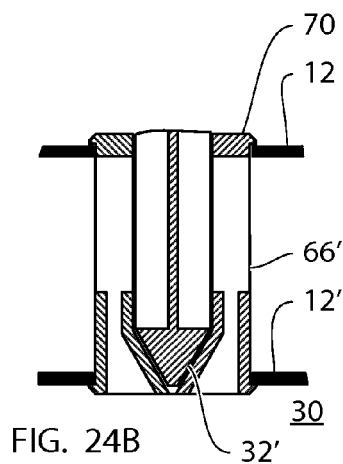
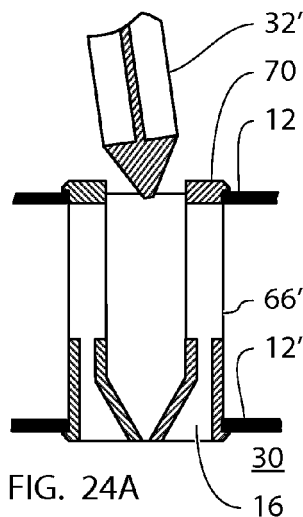
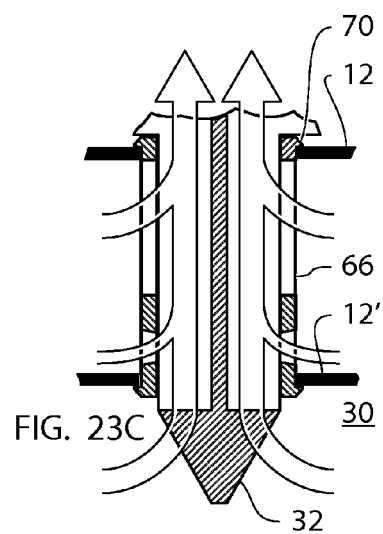
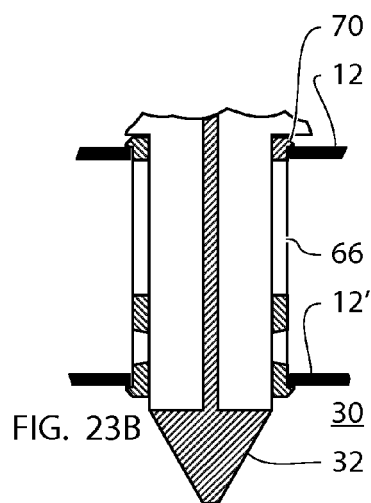
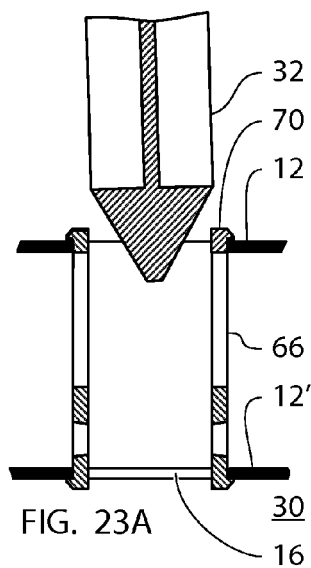


FIG. 22D



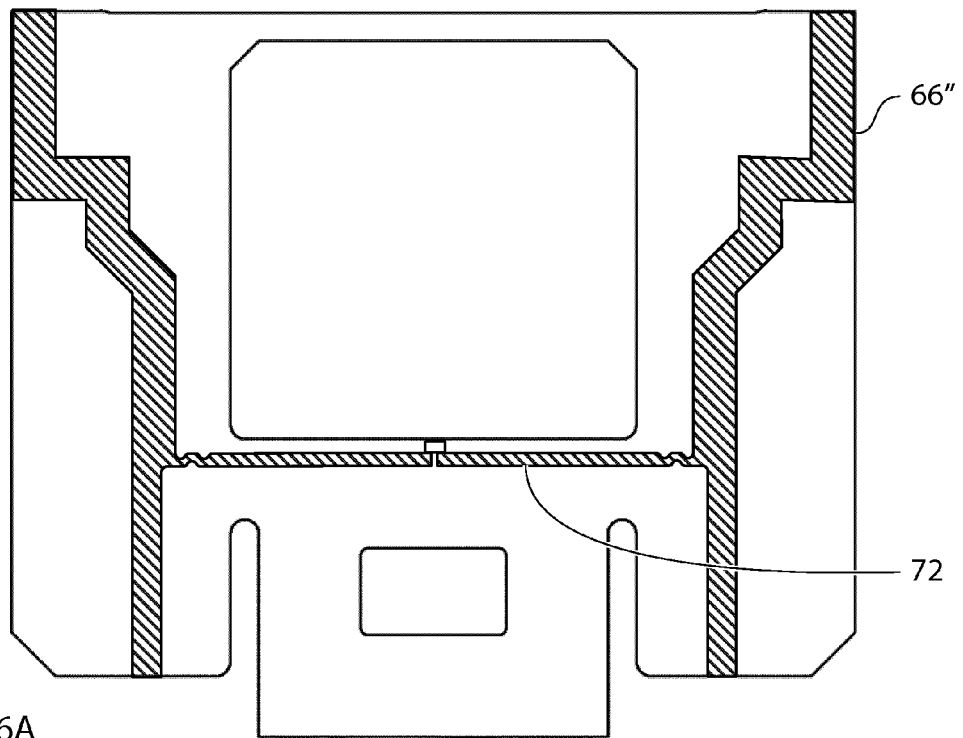


FIG. 26A

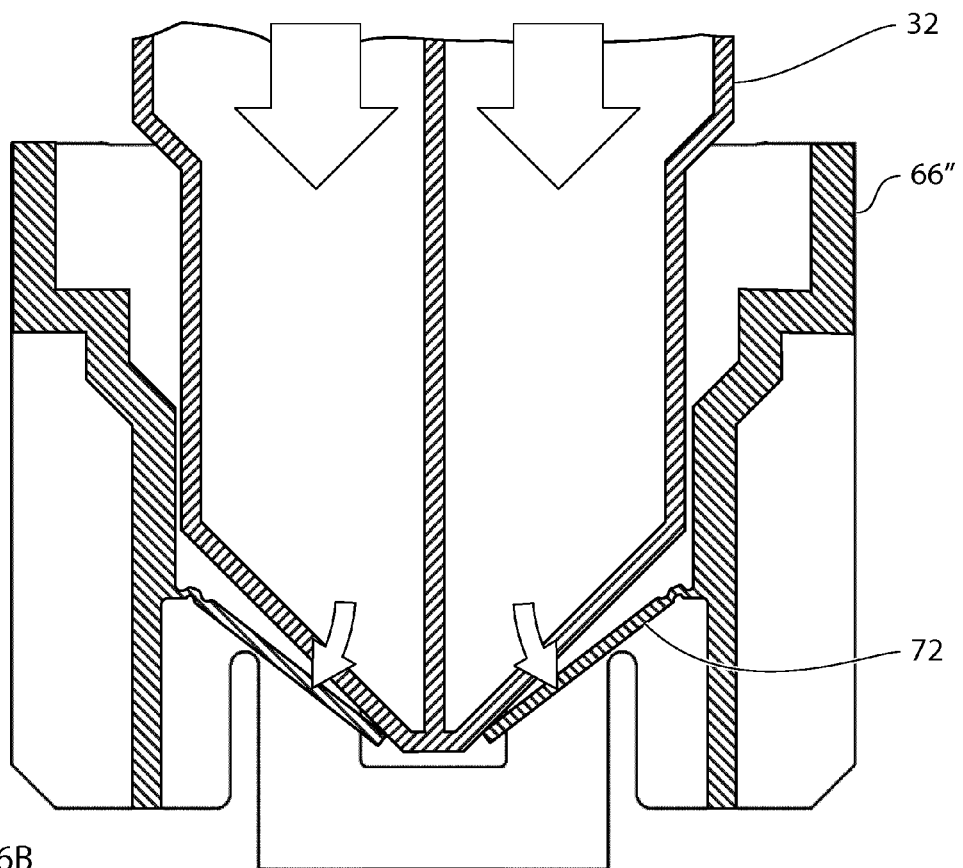
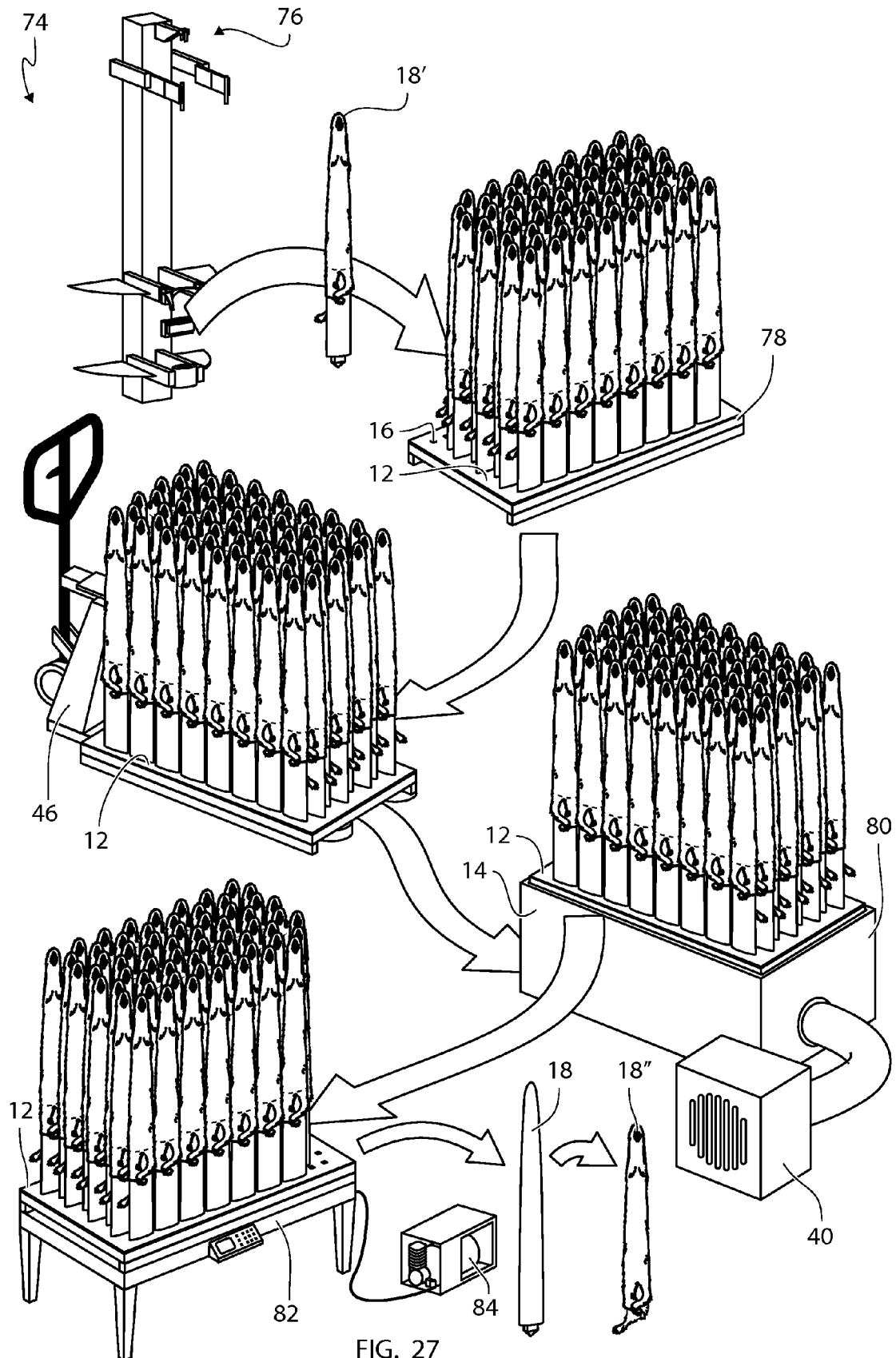


FIG. 26B



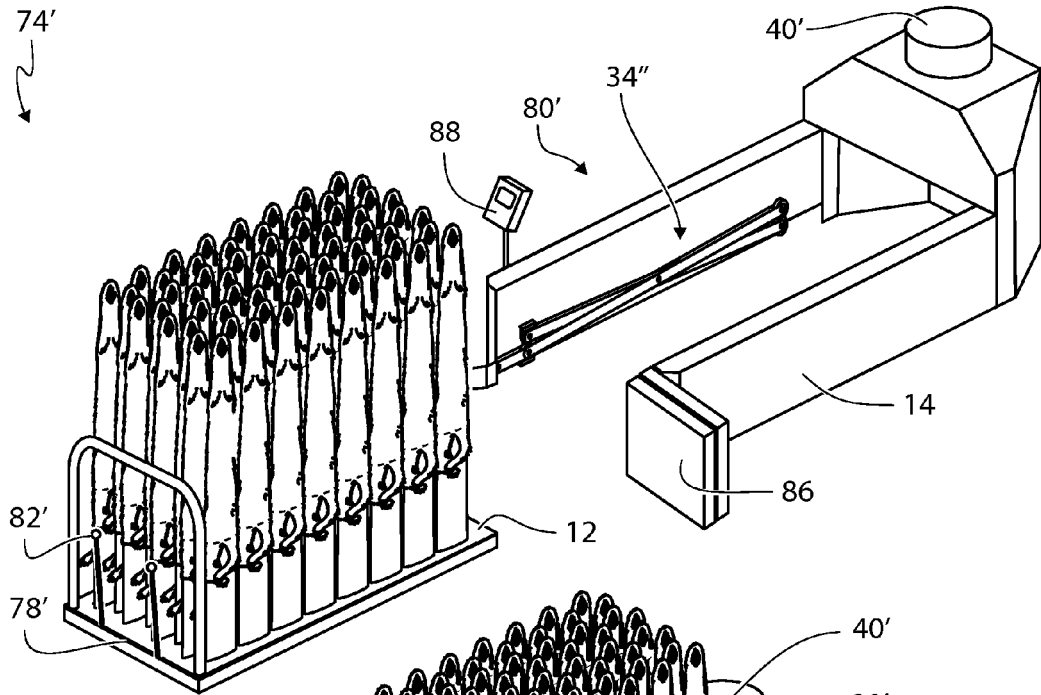


FIG. 28A

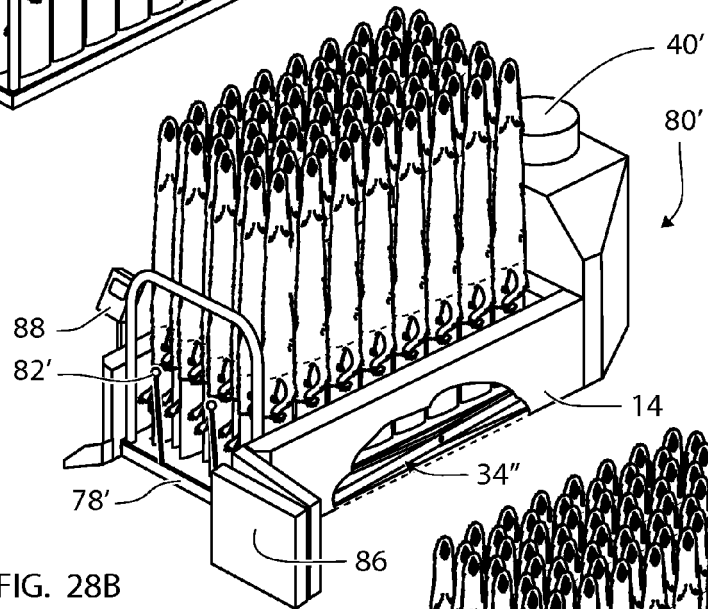


FIG. 28B

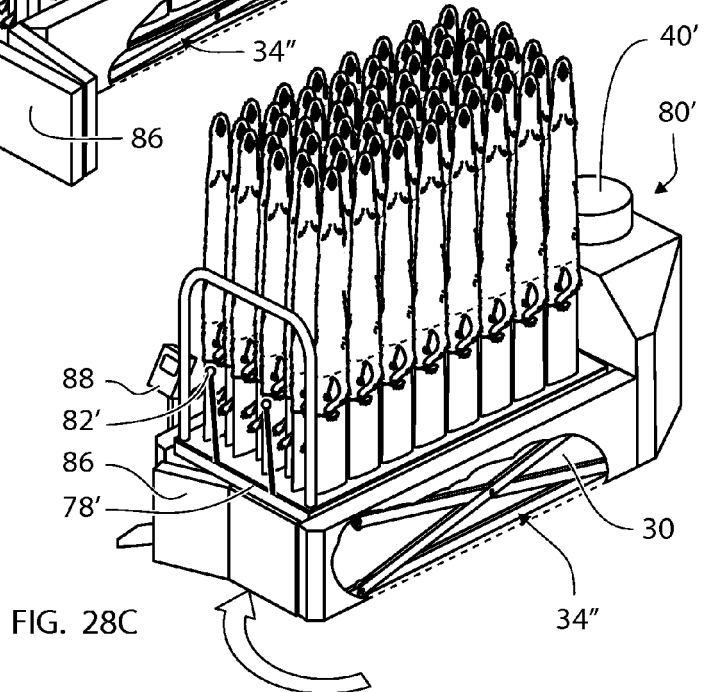


FIG. 28C

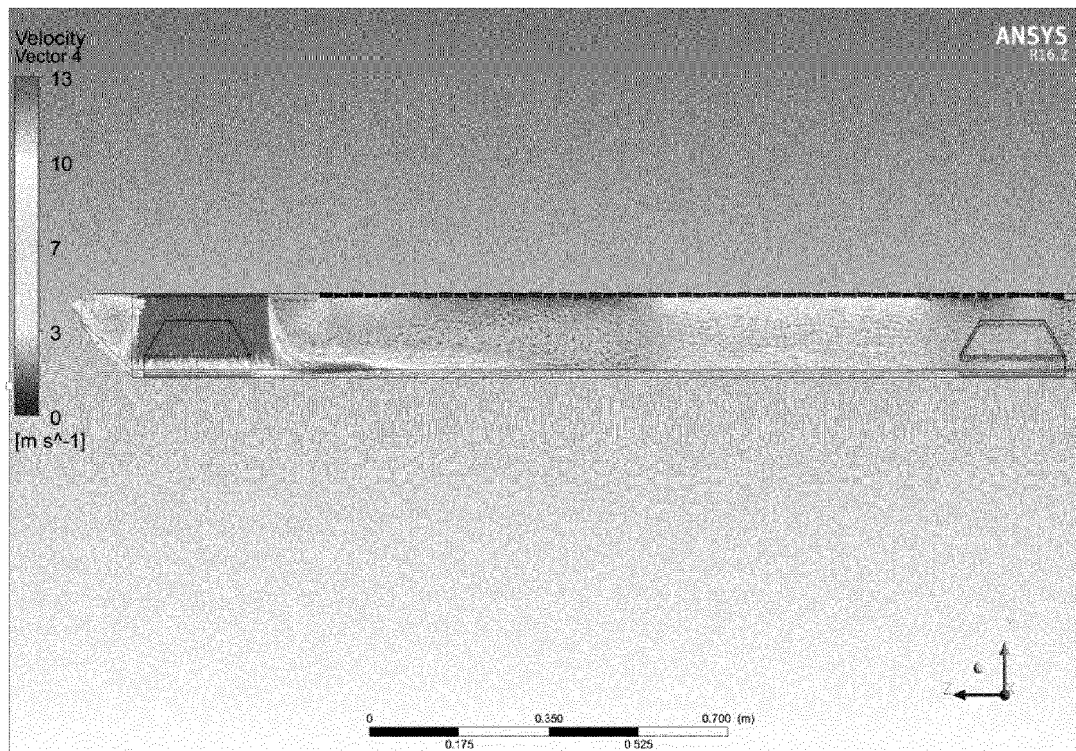


FIG. 29A

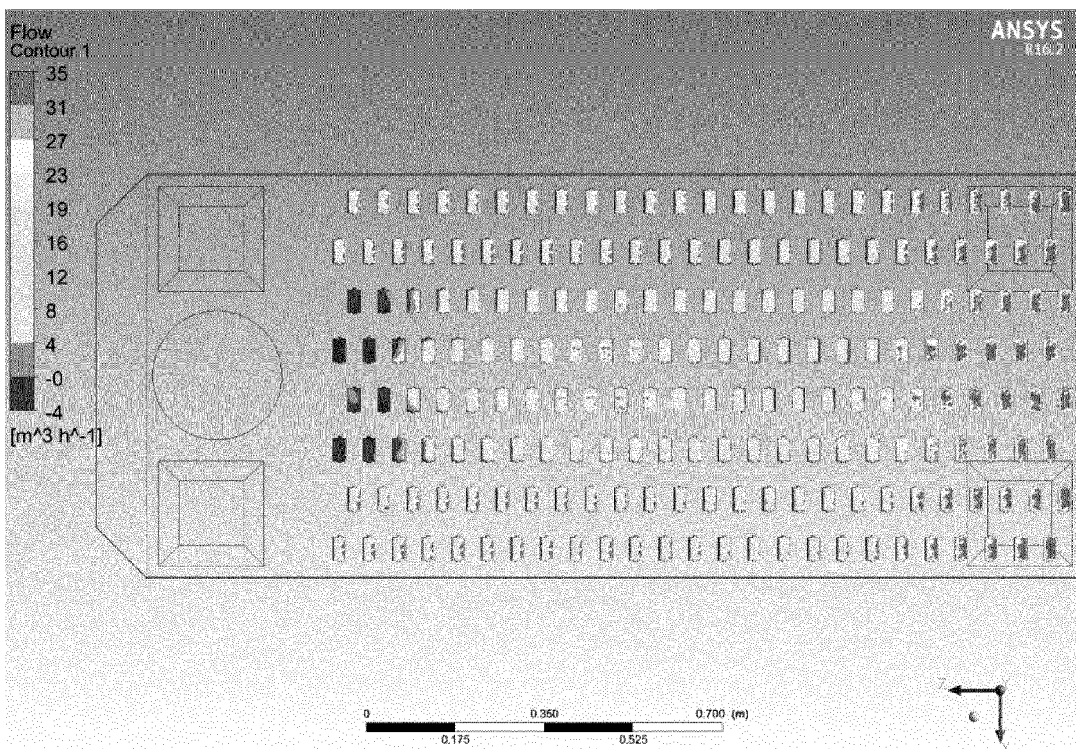


FIG. 29B

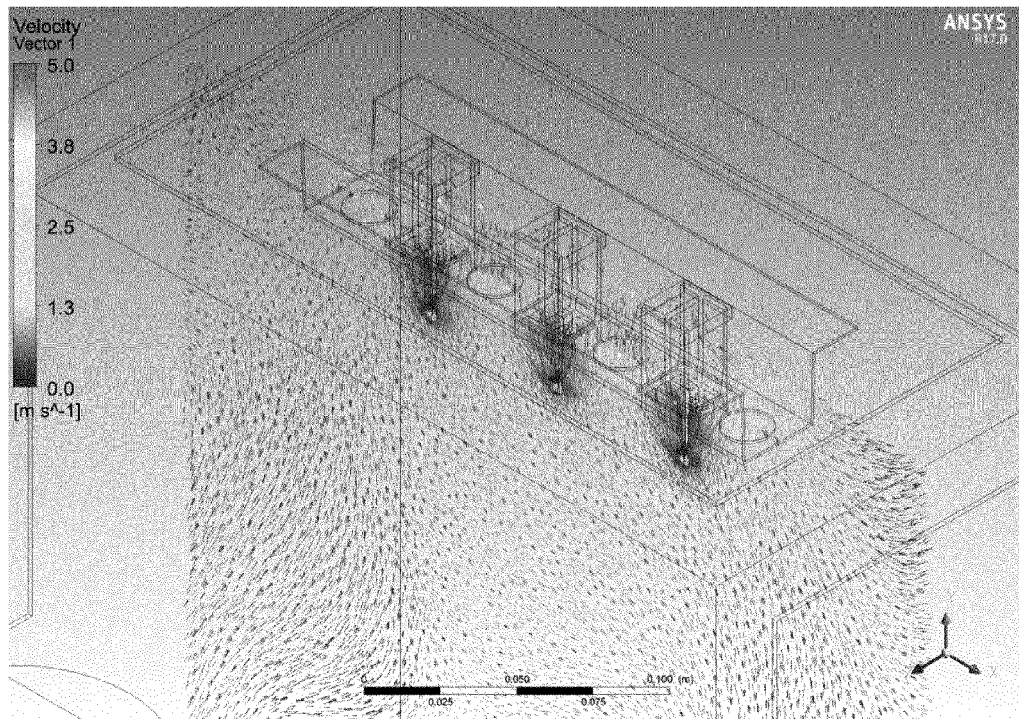


FIG. 29C

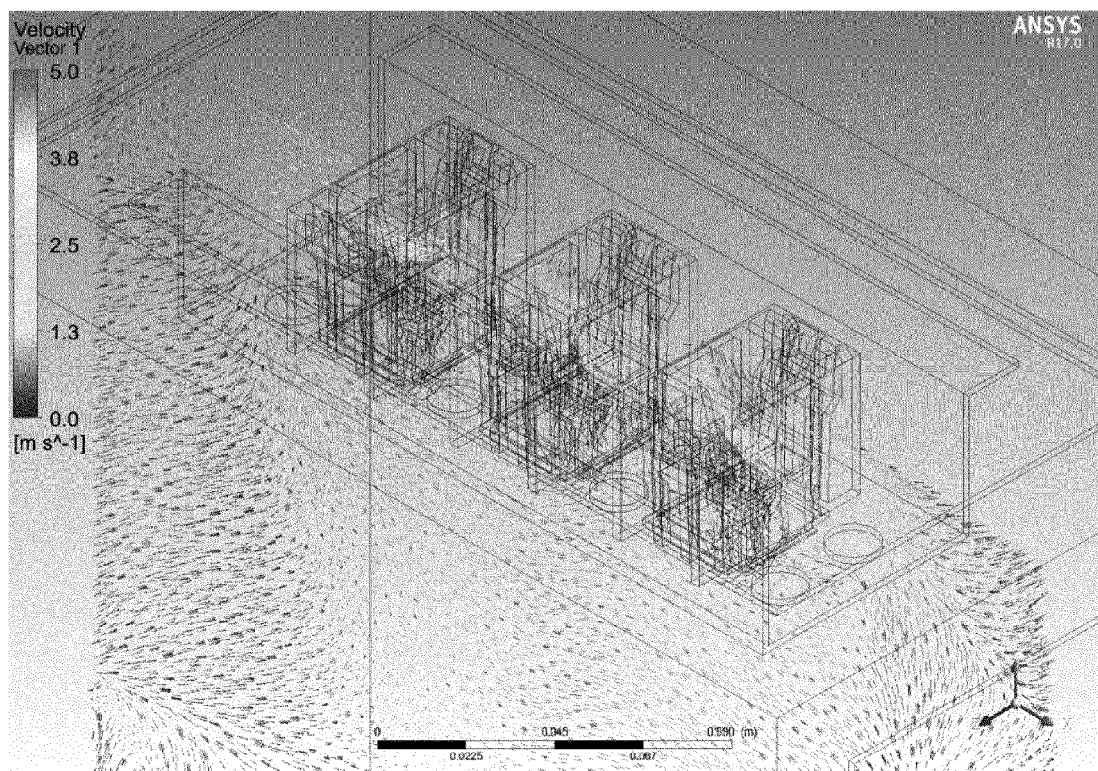


FIG. 29D

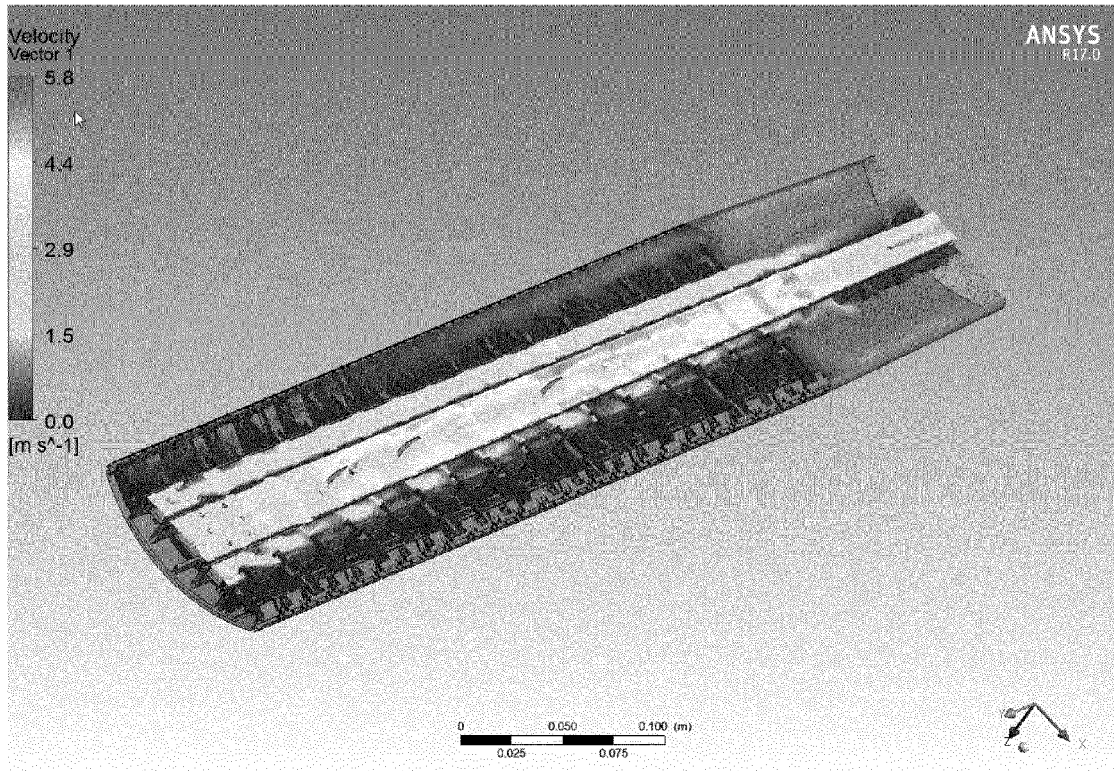


FIG. 29E

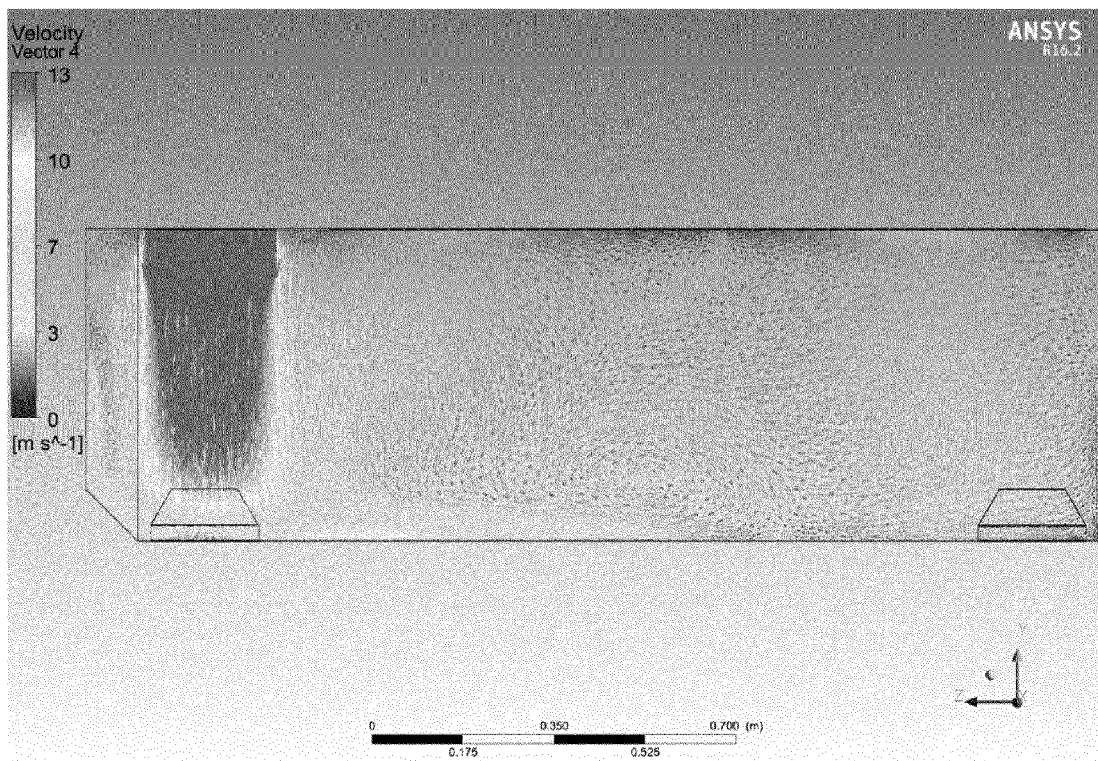


FIG. 29F

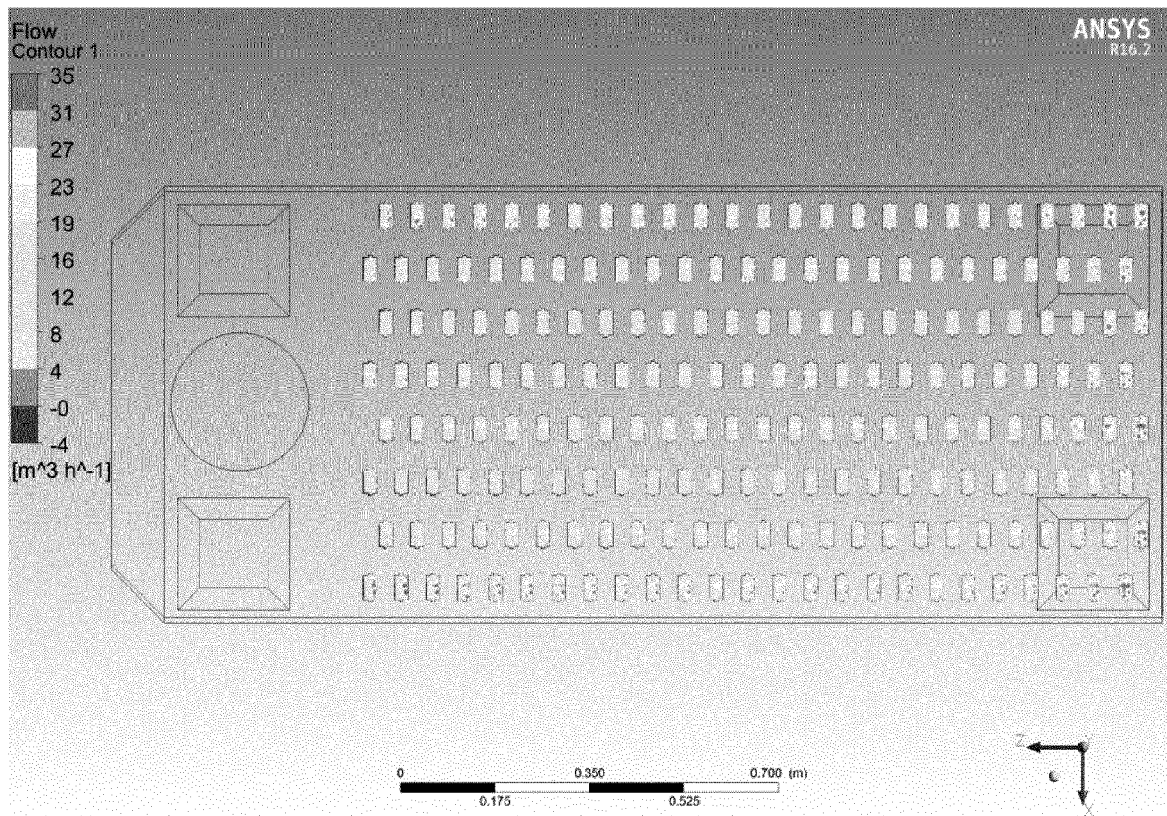


FIG. 29G



EUROPEAN SEARCH REPORT

Application Number
EP 16 16 2910

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A	* page 58, line 22 - page 59, line 8; figures 26,27 * * page 49, line 7 - page 51, line 3 *		
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			TECHNICAL FIELDS SEARCHED (IPC)
			C14B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 March 2017	Examiner Iamandi, Daniela
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 16 16 2910

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

EP 16 16 2910

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 13

Claims 1,2,13 directed to a drying unit comprising a flow distributor disposed within the inner space between the gas inlet and the top plate;

2. claims: 3-12

Claims 3,4,5,6,7,8,9,10,11,12 directed to a drying unit comprising a sidewall having an extent such that the top plate and the bottom plate are capable of defining a distance between themselves of at least 200 mm

3. claims: 14, 15

Claims 14,15 directed to a pelt processing system having a tanning unit with a pelt board operable between an expanded state and an non-expanded state by moving a connecting element relative to a pelt board bottom and a release mechanism for causing the pelt bord to assume a non-extendable state.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 16 2910

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-03-2017

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