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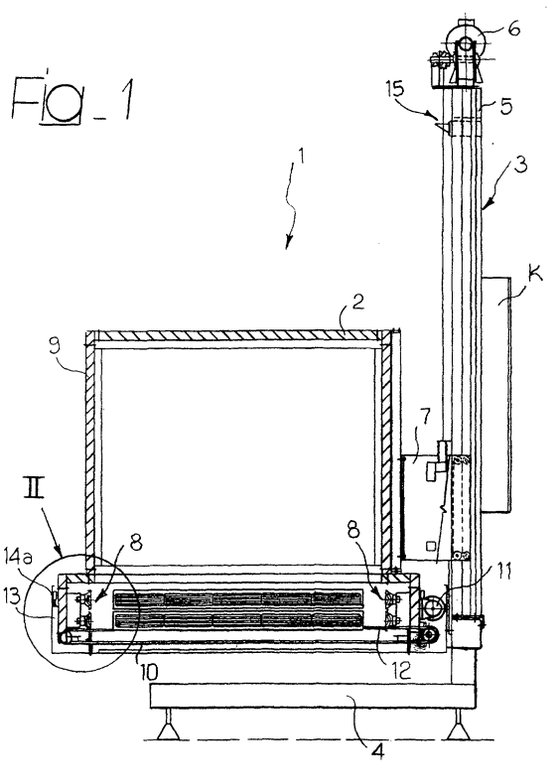
(54) An oven for shrinking heat-shrinkable film packaging

(57) An oven for shrinking heat-shrinkable film packaging comprises:

- a treatment chamber or bell (2) with heating elements (8) associated thereto, said bell being provided with a mouth part; and
- a supporting structure (3) defining a treatment region for placing the packages (P, A) undergoing treatment and having associated to it a movement structure (5 to 7) for imparting on the chamber or bell (2) and on the supporting structure (3) a relative movement between an operating position, in which the chamber or bell (2) is located in a position where it covers said treatment region, and a position of rest, in which the chamber or bell (2) is set at some distance from the treatment region.

Associated to the aforesaid mouth part is a closing unit (10, 12) which can be activated to close selectively the mouth part of the chamber or bell (2) at least when the chamber or bell (2) is in the resting position.

Fig_1



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Description

[0001] The present invention relates to packaging techniques based upon the use of heat-shrinkable film.

[0002] The invention has been developed with particular attention paid to the possible application to heat-shrinkable films used in the form of hoods or bands for the packaging of products, for example on pallets.

[0003] As regards the fabrication and application of extensible film in the form of hoods, useful reference may be made to the European patent application No. 99830767.2 in the name of the present applicant.

[0004] The present invention aims at meeting the requirement for providing a heat-shrinking oven of simple conception, which may be used, for example, for packaging and protecting any type of palletized material, either in packages or loose, for which a good grip on the product, an excellent action of protection in regard to atmospheric agents, and a good anchorage of the packaged product on the base pallet are required.

[0005] The latter aspect assumes particular importance when it is considered that many heat-shrinkable film packages currently used for packaging products on pallets present (precisely on account of the criteria with which heat-shrinking is carried out) the drawback which can be put down to the possible presence of extensive areas in which the packaging material is markedly raised - and hence disengaged - from the pallet on which the products rest. This phenomenon (which appears in the form of the formation of what in the sector jargon is sometimes defined as "miniskirts") means that, although an acceptable level of cohesion of the packaged product is ensured, the packaging film is not able to ensure firm anchorage of the product on the pallet, with the consequent risk of detachment and/or toppling over.

[0006] The absence of solutions that are able to provide a truly satisfactory answer to the requirements outlined above is acutely felt in the sectors of the manufacturing industry and of trade in which it is necessary to package relatively modest amounts of products in heat-shrinkable packaging (e.g., from 10 to 50 pallets per hour), hence amounts such as not to justify the high costs linked to the setting-up of automatic packaging lines that are able to operate at very high rates.

[0007] One of the sectors in which the use of packaging in heat-shrinkable film on pallets is increasingly spreading is that of materials for the building industry. In this sector, there frequently arises the need to package a heterogeneous set of products (tiles, bricks, sacks of cement, lime putty, etc.) on a pallet, as may be required for a contained restructuring job and/or for the daily or weekly needs of a small firm.

[0008] Other consumer-goods sectors of possible interest are the foodstuff sectors, groceries, the manufacturing sector, and in general all those sectors in which endof-line packages are present.

[0009] If it is considered that the individual products that are to be packaged in heat-shrinkable film are picked up from different areas of a warehouse or deposit, the need is evident of being able to carry out the operations of heat-shrinking of the package on the spot, possibly out of doors and, in an even more preferred way, with the possibility of carrying out the heat-shrinking operation in different places according to the specific requirements.

[0010] At present there exist ovens for heat-shrinking of film which operate with one or more gas burners of the naked-flame type, or in any case with heating means that are unprotected in the environment.

[0011] In addition to the drawback linked to the considerable dispersion of heat into the atmosphere (a dispersion which renders these solutions far from efficient from the energy standpoint), there exist the drawbacks linked to the emission of combustion fumes, which are usually produced in a way that is hard to control.

[0012] In many cases, the naked flame may be the source of risks of burns for the operator if the oven is not equipped with suitable external protections.

[0013] Furthermore, if performed using a manual burner, the operation of heating the film usually calls for a certain skill on the part of the operator in order to prevent any regions of the film being insufficiently heated, and hence insufficiently shrunk, whilst other regions are overheated to the point of producing local melting/burning.

[0014] The same drawbacks exist to a greater or lesser extent in other known systems which envisage enclosing the area or chamber in which heat-shrinking is carried out within a hood or bell structure. The latter solution, however, does not lessen the drawbacks linked to the dispersion of heat outside.

[0015] The purpose of the present invention is therefore to provide a heat-shrinking oven that is able to meet the needs outlined previously in an optimal way, overcoming the drawbacks of the known solutions.

[0016] According to the present invention the above purpose is achieved thanks to an oven having the characteristics specifically called for in the ensuing claims.

[0017] The invention will now be described, purely by way of non-limiting example, with reference to the attached drawings, in which:

- Figure 1 is a vertical sectional view of an oven according to the invention;
- Figure 2 illustrates, in greater detail and at an enlarged scale, the part of Figure 1 indicated by the arrow II;
- Figures 3 and 4 are schematic illustrations of a possible improved version of the oven according to the invention; and
- Figures 5 and 7 illustrate different modes of operation of an oven in accordance with the invention according to the geometrical characteristics of the packages undergoing heat-shrinking.

[0018] As may be seen more clearly in the view of Fig-

ure 1, the oven according to the invention, designated as a whole by 1, comprises, as its main element, a mobile structure 2 basically configured as a chamber open at the bottom, in such a way that it presents a general bell-like structure.

[0019] In the example of embodiment here illustrated, the structure 2 defines a parallelepipedal chamber. Albeit preferential, this choice is, however, not to be considered imperative for the purposes of the implementation of the invention, given that the chamber 2 could have a different shape, for example a cylindrical one.

[0020] The chamber 2 is supported in cantilever fashion by a structure 3 made of sturdy metal that rests on the ground by means of a foot 4 which, in plan view (for reasons that will appear more clearly from what follows), has a general C or channel shape open on the "front" side of the oven.

[0021] The top part of the structure 3 consists of a portal element 5 which extends upwards starting from the closed side of the foot part 4. The portal element 5 is provided with vertical guides on which a carriage 7, driven by a motor 6 (this is typically an electric motor, but it could be a hydraulic motor), slides.

[0022] By moving on the guides of the portal structure 5, the carriage 7 makes it possible to displace the chamber 2 selectively between a raised position, in which the product is introduced into the heat-shrinking chamber (see Figure 4), and a lowered position, which is adopted when the heat-shrinking operation is carried out (see, for example, Figure 1).

[0023] The structure of the chamber or bell 2 consists preferably of a heat-insulated metal frame as base, within which a heating system 8 is housed, which can be made up of a number of batteries (commonly known as "ramps") of heating elements. The said heating elements usually consist of electrical infrared-wave elements, or else radiant burners (preferably catalytic ones) supplied with liquid gas or methane.

[0024] The aforesaid heating elements are designated as a whole by 8 in Figures 1 and 2. In the plan views of Figures 5 to 7, these same elements are respectively designated by 8a and 8b so that it is possible to distinguish (for reasons that will appear more clearly from what follows) two sets of heating elements, each pair being associated to one of two pairs of parallel opposite sides of the base profile of the chamber 2, the said profile, in the embodiment of the invention illustrated herein being substantially square.

[0025] Above the heating elements 8 (which are located in the lower part of the chamber 2 in an area adjacent to the mouth part of the chamber 2, which opens downwards), the structure of the chamber 2 is made up of panels, which are preferably of a self-supporting type and/or are made of a lined material with high heat-insulating capacity. The aforesaid panels are connected together, for example, by angle-section elements 9 made of metal.

[0026] It is, however, evident that, although being considered at the moment preferential, the said constructional items (like the constructional items that will be illustrated in greater detail in what follows) are not in any way to be considered as imperative for the purposes of implementation of the invention.

[0027] This applies, for example, also to the structure of the portal part 5, which, in the example here illustrated, basically consists of two vertical uprights on which the lifting carriage 7 runs, the latter being driven by the motor (motor reducer 6) via a gear-and-chain mechanism.

[0028] An important characteristic of the solution according to the invention is represented by the presence, in the bottom part of the chamber or bell 2, of a closing system comprising, in the currently preferred embodiment of the invention, a horizontal curtain or blind 10 made of an insulating fabric which is resistant to high temperatures. The task of the closing system in question is to close selectively the opening of the mouth part of the chamber or bell 2 so as to prevent dispersion of heat outside the chamber or bell 2.

[0029] In the currently preferred embodiment of the invention, for assembly and operation of the curtain or blind 10 a structure is used which substantially resembles that of a roller blind.

[0030] At a point corresponding to one of the sides of the bottom portion of the bell 2 (for example, at the side facing the portal structure 5), a winding roller 11 is mounted, on which the blind 10 is recalled into the wound position thanks to the presence of return springs that act on the roller 11 itself so as to cause its rotation in the direction corresponding to complete winding of the blind 10 onto the roller 11 itself.

[0031] The aforesaid return springs cannot be seen in the attached drawings, but since it is in any case a commonly adopted solution, for example in normal roller blinds for domestic use, the general structure of the mechanism and the corresponding constructional details are to be deemed altogether known and such as not to require a detailed description herein.

[0032] The movement for opening and closing the blind 10 is obtained by anchoring the distal edge of the blind 10 (i.e., the edge that is furthest away from the roller 11) onto a cross member carried by two chains 12 closed to form a loop and driven by a motor that is not explicitly visible in the drawings but is of a known type.

[0033] The return springs associated to the roller 11 ensure tensioning of the blind 10 in all the positions of movement of opening/closing. Furthermore, the aforesaid return springs and the motor in practice operate as antagonistic systems in conditions such as to make it easier to obtain speeds of movement of the blind that are on the whole uniform, irrespective of the diameter of the amount of blind 10 wound on the roller 11.

[0034] Also in this case, the specific constructional details of the system do not constitute imperative characteristics. The persons skilled in the sector may, in fact, readily identify and devise functionally equivalent sys-

tems aimed at enabling selective closing of the bottom part or mouth of the chamber or bell 2.

[0035] Preferably, the aforesaid bottom mouth part is surrounded by a ring structure 13 consisting, in the example of embodiment illustrated, of a rim or frame having an approximately square shape. The structure 13 is formed, on the four sides of the mouth part of the bell or chamber 2, by angle section (see, in particular, the view of Figure 2) mounted on the structure of the chamber or bell 2 by means of sliding elements 14, which are made up, for example, of assemblies comprising a tubular skirt or jacket fixed onto the structure of the chamber or bell 2 and a stem carried by the section of the structure 13 and slidably mounted within the aforesaid tubular jacket, the aim being to render the structure 13 as a whole floating in the direction of a possible contained raising with respect to the structure of the chamber or bell 2 that in any case supports the structure 13, carrying it along with itself in the movement of raising/lowering imposed by the carriage 7.

[0036] The structure 13 has the function of protecting the blind 10 and the various elements that ensure the latter's movement from outside.

[0037] Furthermore, the fact that the structure 13 is mounted floating can also be exploited to enable sensors 14a (for example of the proximity-switch type or the like) to be arranged so that they are connected to the main control unit K (which consists, for example, of a PLC or a similar processing unit), which automatically controls operation of the oven, and in particular movement of its moving parts.

[0038] According to the signals coming from the sensors 14a, the unit K can then interrupt the movement of descent of the carriage 7, should the bottom edge of the bell or chamber 2 - defined by the structure 13encounter an obstacle in its descending motion.

[0039] Preferably installed on the portal part 5 is also a safety system consisting of a latch 15, which is a mechanical device that is automatically activated and engages the carriage 7 and/or the chamber or bell 2 in the fully raised position (see in particular Figure 7), so as to withhold the chamber or bell 2 firmly in conditions of safety, thus preventing the bell or chamber 2 from accidentally and undesirably coming down while the operations are in progress of insertion and/or picking-up of the packaged products in or from the area where the heat-shrinking operation is being carried out.

[0040] The aforesaid latch 15 is interlocked with the main control unit K in such a way that the unit K ensures disengagement of the latch 15 (with the consequent restoring of the possibility of movement of the chamber or bell 2 downwards) only as a result of a positive command issued on its control panel, and preferably after complete opening of the blind 10 has been verified.

[0041] From the side elevation of Figure 1 it may moreover be appreciated that the foot part 4 of the structure of the embodiment according to the invention is at a height from the ground that is, on the whole, small (for example, 180 mm). This makes it possible to cause a continuous transporting system (such as a roller conveyor or chain conveyor) for carrying palletizable loads that are to undergo treatment in the oven according to the invention to travel on top of the said structure and beneath the chamber or bell 2. In this way, the oven can be automated, so enabling its operation at a substantially continuous rate.

[0042] As has already been said previously, the aforesaid foot part 4 has a channel shape which is open on the front side of the oven 1 for the purpose of facilitating introduction of the pallets P on which the packaged products A are located (wrapped or hooded in a heat-shrinkable film).

[0043] Figures 3 and 4 refer to the possibility of installing, in the area in front of and beneath the oven 1, a shuttle-type conveying system which can slide on two guides 16, on which the pallet P carrying the articles A can be placed in order to facilitate its displacement (in either direction) between a loading area (the pallet P and the articles A being represented by a dashed line in Figures 3 and 4) and the heat-shrinking area, in which the bell or chamber 2 acts (pallet P and articles A being represented by a dashedand-dotted line in Figures 3 and 4).

[0044] In this way, the operations of loading and unloading the products to be packaged can be carried out in an area outside the operating area of the oven. This facilitates the work of the operator by preventing the need for the latter to carry the pallet P and the articles A located thereon directly into the operating area of the oven 1.

[0045] This fact is important for at least two reasons:

- in the first place, because it guarantees absolute safety of the operator.
- in the second place, because it enables the operations of depositing and picking up the pallets P and the articles A located thereon to be carried out in an area that is, on the whole, free and at a sufficient distance from the oven 1, so preventing the risk of possible undesirable impact or collisions against the structure of the oven 1.

[0046] The operations of introduction and extraction of the pallet to be packaged are in fact usually carried out with the aid of a fork-lift truck or a manual rudder-type transpallet.

[0047] The use of a fork-lift truck entails the risk of collision of the vertical upright of the truck against the bell or chamber 2, with consequent damage to the latter. It should moreover be considered that, in order to obtain a uniform heating, the pallet P and the products A must preferably be located in the centre of the oven.

[0048] The aforesaid drawbacks could, at least virtually, be overcome by equipping the fork-lift truck with forks that are considerably longer than the ones commonly used, or else by getting the bell or chamber 2 to ascend considerably higher. These solutions would,

however, prove inconvenient and costly to implement.

[0049] On the other hand, the use of a manual transpallet would force the operator, again for the reasons mentioned previously, to move into a position right underneath the bell 2.

[0050] Such problems are altogether eliminated with the solution illustrated in Figures 3 and 4, which enables loading and unloading to be carried out in an area at a distance from the operating area of the oven. In practice, by means of the guides 16, it is possible to provide a shuttle structure for displacement of the pallet P. The said shuttle structure makes it possible, wherever necessary, to stack the load directly on the pallet P, so limiting the use of the lift truck only to transporting the pallet P and the products A, already securely wrapped in heat-shrunk film, i.e., when the ensemble is already completely stable.

[0051] The solution illustrated in Figures 3 and 4 thus makes it possible to operate in conditions of safety, whilst also saving time.

[0052] It is in any case evident that the structure of the oven according to the invention makes it possible to render the oven 1 easily transportable as whole, thus converting it from a fixed processing station into a mobile station that can be carried just where the products to be packaged and/or the corresponding pallets are stored.

[0053] In this connection, it can be readily understood that the structure of the foot 4 can be provided with a pair of chucks (or else be configured from the start in the form of a pair of chucks), which can be picked up by a fork-lift truck in such a way that the oven can be transported into the area of use.

[0054] The foregoing affords the additional possibility of transporting, together with the structure of the oven, also a gas cylinder having the required capacity in the case where the oven is one for which gas-fired heating is adopted. Of course, in the case where there exists a gas-distribution system or where the oven 1 is electrically supplied, it is sufficient to associate to the structure rendered mobile corresponding lines for supplying the servo means adopted for heating.

[0055] In the case where the oven uses heating elements or elements made up of electrical radiant panels, there do not exist, even in the presence of a bell 2 that is completely closed, problems of air/oxygen supply.

[0056] Tests carried out by the applicant prove that even in this latter case it may be advantageous to provide, in the top part of the bell 2, a pipe or chimney (not visible in the drawings) to enable venting of any humidity that may be produced inside the chamber or bell 2, and thus prevent the undesired formation of condensate on the internal walls of the said chamber or bell 2.

[0057] In the case where gas-fired heating elements 8 are used, there exists the need, when the bell is closed, to supply the air necessary for activation of combustion in the ideal amount to maintain a proper stoichiometric ratio.

[0058] For this reason, in the area immediately above the heating elements 8 (see Figure 2), a distribution header 17 is installed, which runs along the perimeter of the base frame of the chamber or bell 2. The aforesaid header 17 is connected to a centrifugal impeller (or some other pumping element) capable of feeding the amount of air normally required for combustion into the bell 2.

[0059] In the underside, along the entire perimeter of the header 17, a series of holes 17a are made, such as to give rise to a flow of air for combustion, which impinges on the heating panels 8 from above downwards. A gate valve (not illustrated) set in front of the suction inlet of the pumping member has the purpose of partializing the flow of air, so adapting it to the type of gas used and to the feed pressure of the burners.

[0060] The tests conducted by the present applicant have shown (in a way rather unexpected from many points of view) that the creation of such a flow of air-directed so as to impinge upon the heating panels from above downwards with the aim of a subsequent diffusion in a centripetal direction, i.e., towards the central region of the chamber or bell 2, again in the bottom area of the latter - proves beneficial also in the case where the heating elements 8 are of an electrical type.

[0061] In both cases (i.e., both with gas-fired elements 8 and with electrical heating elements 8), the solution has proved preferential of blowing air downwards against the heating elements 8 from a distance of a few centimetres so as to convey the irradiation of the heating elements 8 downwards into an area in which there are deflector elements 18 projecting towards the inside of the chamber or bell 2. The said deflectors 18 bounce back the hot air in a horizontal direction, i.e., into the position normally occupied by the foot for anchoring the heat-shrinkable film around the pallet P for supporting the product A.

[0062] This is precisely the area indicated by the arrows Z in Figure 4, i.e., the area in which the bottom part of the heat-shrinkable film-wrapping wraps along the perimeter and under the peripheral edge of the pallet P.

[0063] Albeit without wishing to be tied down to any specific explanation in this connection, the applicant has good reasons to think that the solution described is such as to cause the phenomenon of heating - and hence of heat-shrinking - of the film to start (or at least to be performed in an altogether regular and determined way) at the aforesaid region indicated by the arrows Z. This fact causes the heat-shrinkable film to be radiused and anchored firmly along the perimeter of the pallet P, so favouring firm anchorage of the articles A thereon, likewise preventing the formation of uncovered areas (the so-called "miniskirts"), which may act as points or regions that give rise to possible phenomena of separation or toppling over of the articles A from the pallet P.

[0064] In any case, in addition to the occurrence of the aforesaid negative phenomena in the areas left uncovered by the miniskirts, the desired effect of protection

of the product with respect to external agents (atmospheric agents, dust, etc.) is anyway lost.

[0065] The experiments conducted by the applicant show that the use of the curtain or blind 10 (and, in general, the fact that the chamber or bell 2 is provided with means such as to enable closing of the mouth part during the stages in which the heat-shrinking operation is not carried out) enables savings in terms of energy consumption and operating time that are altogether surprising.

[0066] For example, with a heating power of 33 kW (in the case of electrical heating elements 8) or with a heating power of 28 kW (in the case of gas-fired heating elements 8 of the catalytic type), the results described in what follows were obtained.

[0067] In the case where the oven is cold when it is switched on and the bell 2 is open at the base, the time necessary for reaching the working temperature (typically around 200°C) is never less than 60 minutes.

[0068] When the solution according to the invention is adopted, the aforesaid time interval is reduced to 25 minutes.

[0069] With the oven hot and operating, i.e., in conditions in which the heating elements 8 are essentially used to carry out a function of maintenance of the temperature in the chamber or bell 2, with the bell open at the base, it is found that, after a heat-shrinking treatment, to bring the oven back to the working temperature and to recover the heat released, typically 20 minutes are required.

[0070] With the solution according to the invention the waiting time is reduced to one minute.

[0071] The data given above highlight how marked the advantages are - both in terms of energy saving and in terms of speed of treatment - that may be achieved with the solution according to the invention.

[0072] It should moreover be noted that when the chamber or bell 2 is in a completely raised position (Figure 4), and hence with the oven 1 in the pause step, the presence of the blind 10 in the closed position creates a condition of intrinsic safety for the operators both because access, including accidental access, to the inside of the chamber or bell 2 is in any case prevented, and because any harmful reverberation of heat outside the bell 2 itself is eliminated.

[0073] The typical operating cycle of the oven 1 is controlled by means of a programming operation carried out from the control unit K, performed according to criteria that are in themselves evident for a person who is skilled in programming such control units, once the sequence of steps described in what follows has been defined.

[0074] At start-up, the oven 1 is cold, and the bell or chamber 2 is in the raised position, with the blind 10 closed and the safety latch 15 in the engaged position.

[0075] The oven is switched on (this is usually done by means of a main switch), so starting the step of preheating of the bell 2 until the working temperature is reached (as has already been said, approximately 200°C); this is likely to require an interval of 20-25 minutes. Lighting of the gas burners (when these are used to make the elements 8) occurs automatically.

[0076] Once the operating temperature has been reached, the heating elements 8 reduce their power in order to cut down on energy consumption, and only supply the heat needed for maintaining the temperature.

[0077] Once the above conditions have been reached, it is possible to start the operating cycle. This can be done, for example, by pressing a cycle-start button located on the panel of the control unit K by an operator, once a pallet P with the corresponding products A arranged on it and wrapped in a hood or bands of heat-shrinkable film, has been set in the working area of the oven.

[0078] The operation of start of cycle determines automatic opening of the bottom part of the bell or chamber 2 with the winding of the blind 10 onto the roller 11.

[0079] Furthermore, the safety latch 15 is disengaged, so that the carriage 7 can start to come down along the uprights of the portal part 5 in such a way as to cause the chamber or bell 2 to come down in order to bring the latter into a position where it can receive the articles A stacked on the pallet P and wrapped in the film that is to be heat-shrunk.

[0080] It will be appreciated that the movement described above has the characteristics of a relative movement, so that, in a possible variant embodiment of the invention, the bell 2 can be kept in a fixed position, and a raising/lowering movement can be imparted on the ensemble made up of the articles A deposited on the pallet P and wrapped in the film to be heat-shrunk. At the same time as the aforesaid relative movement, a command is issued for operation of the heating elements 8 in such a way as to ensure the supply of the heating energy necessary for heat-shrinking.

[0081] The bell is kept in the lowered position for a pre-set time calculated in such a way as to give rise to the formation of the foot for anchoring the film to the pallet (area indicated by the arrows Z in Figure 4) and to complete heat-shrinking of the film.

[0082] Once this result has been achieved, the bell 2 starts to come up at a controlled speed until the safety latch 15 re-engages.

[0083] At the same time, closing of the bottom part of the chamber 2 by the blind 10 takes place.

[0084] Possible subsequent cycles can repeat the cycle described previously starting from the operation of start of cycle by pressing the corresponding button. These subsequent cycles in general all take place automatically. In the case of the oven operating with an intermittent cycle, a command for start-up is issued manually by an operator. In the case where the oven operates with a continuous cycle on an automatic line, start-up can take place automatically in sequence according to a corresponding command signal issued by the system main control unit.

[0085] It will be appreciated that the oven that has just

been described presents characteristics of suitability for a production rate per hour that may reach (with the values of absorbed power referred to previously) a pallet output in the region of 20 pallets per hour.

[0086] The same oven (in particular if it is inserted in an automatic line) can, in any case, be reconfigured so as to increase the production capacity.

[0087] For this purpose it is sufficient to install a series of heating elements having a higher heating power on the base frame of the bell 2 which supports the heating elements 8, and thus obtain shorter preheating and heat-shrinking times.

[0088] By increasing at the same time the frequency of operation of the motor 6 that raises and lowers the bell 2, and consequently the speed of the motor 6, it is possible (using a more powerful heat generator) to achieve higher operating speeds without any modification in the structure of the oven. In this way, for example, by doubling the heat-generating power of the oven, it is possible to double the productivity of the oven in terms of pallets per hour undergoing heat-shrinking treatment.

[0089] The plan views of Figures 5 to 7 illustrate the possibility of operating the batteries of heating elements 8a and 8b associated to the pairs of opposite sides of the rim of the bell or chamber 2 in a differentiated way.

[0090] For example, in the case of a pallet P and a load of products A set thereon having a parallelepepidal shape introduced into the oven 1 lengthways, i.e., with the larger dimension of the pallet P oriented in the direction of insertion into the oven (see Figure 5), the two batteries of heating elements 8a that are closer to the pallet (and hence to the film that is to be heat-shrunk) are fed with a lower supply of heat (for example, with a lower gas pressure) than are the elements 8b that are at a greater distance from the film.

[0091] The evident purpose is to prevent overheating of the film that is nearest to the heating elements, with the consequent possible melting of the film itself. On the other hand, the heating elements 8b that are further away from the film are fed with a higher supply of power (for example, with a higher gas pressure) precisely to ensure uniform heating conditions over the entire surface of the film.

[0092] On the other hand, in the presence of a pallet P and a set of products A which are virtually identical to the ones described previously but are introduced into the oven 1 sideways or crossways, i.e., with the direction of greater extension orthogonal or substantially orthogonal to the direction of introduction into the oven (see Figure 6), the conditions of supply of the heating elements 8a and 8b are reversed with respect to the ones described previously: consequently, a smaller supply of power to the heating elements 8b, which in this case are closer to the film, and a lower supply of power to the elements 8a, which are now further away.

[0093] In the conditions illustrated in Figure 7 (for example with the pallet P having a square or cylindrical shape), the various batteries of heating elements 8a, 8b - all set practically at the same distance from the film - are supplied in a uniform way with a substantially uniform power ratio.

[0094] Once again it is recalled (with reference to Figure 2) that there is the advantage of arranging a jet of air directed downwards from above so as to enable convergence of the flow of hot air towards the pallet, and thus favour the formation of the foot for anchoring the film to the base pallet, so improving heat-shrinking of the film and likewise increasing the general efficiency of the oven, with a consequent reduction in consumption and operating time. In the case where the said jet of air also has the function of supplying comburent (in the case of gas-supplied heating elements 8) it appears advantageous to create conditions for a supply in excess of air in order to prevent the undesirable production of carbon monoxide during combustion.

[0095] In order to improve performance of the oven 1 from the energy standpoint it is possible to associate to the oven 1 an economizer or recirculation circuit, as represented schematically in Figure 4. The function of this circuit is basically that of taking in, by means of a pipe 100, a part of the air that is still rich in oxygen (it is to be recalled that combustion preferably takes place in excess of oxygen) from the top part of the chamber or bell 2. Instead of being totally dispersed outside through the chimney 101, this air is sent back through the pipe 102 inside the header 17 so as to be re-admitted inside the chamber or bell 2 starting from the bottom part of the latter, where the heating elements 8 are present. This preferably takes place under the action of a pumping element 103, such as an ordinary impeller and/or by mixing with fresh air introduced from outside through an additional delivery pipe 104. The air thus blown in is consequently hotter, so improving the efficiency of the oven. In particular, the effectiveness of the action of recirculation may be regulated by means of gate valves 105, 106 set inside the pipes 101 and 104.

[0096] Of course, without prejudice to the principle of the invention, the details of implementation and the embodiments may vary widely with respect to what is described and illustrated herein, without thereby departing from the scope of the present invention as defined in the annexed claims.

Claims

1. An oven for shrinking heat-shrinkable film packaging, **characterized in that** it comprises:

   - a treatment chamber or bell (2) with heating elements (8) associated thereto, said bell being provided with a mouth part; and
   - a supporting structure (3) defining a treatment region for placing the packages (P, A) subject to treatment and having associated thereto a movement structure (5 to 7) for imparting on

said chamber or bell (2) and on said supporting structure (3) a relative movement between an operating position, in which said chamber or bell (2) is located in a position where it covers said treatment region, and a position of rest, in which said chamber or bell (2) is set at some distance from said treatment region;
and **in that** associated to said mouth part is a closing unit (10 to 12) which can be activated to close selectively the mouth part of said chamber or bell (2) at least when said chamber or bell (2) is in said position of rest.

2. The oven according to Claim 1, **characterized in that** said closing unit (10 to 12) comprises a motor-driven curtain blind formation (10) selectively translatable between a wound position, in which said blind formation (10) leaves said mouth part uncovered, and an extended position, in which said blind formation (10) extends so as to close said mouth part.

3. The oven according to Claim 2, **characterized in that** said blind formation (10) is made of a heatresistant fabric.

4. The oven according to Claim 2 or Claim 3, **characterized in that** it comprises a roller (11) for winding said blind formation (12).

5. The oven according to any one of the preceding claims, **characterized in that** said closing unit (10 to 12) comprises a mobile structure with motor-driven chains (12) to draw selectively a closing formation (10) between a position of disengagement with respect to said mouth part and a position where it closes said mouth part.

6. The oven according to any one of the preceding claims, **characterized in that** said heating elements (8) are positioned, at least in part, in an area corresponding to said mouth part of the chamber or bell (2).

7. The oven according to any one of the preceding claims, **characterized in that** it comprises blowing elements (17, 17a) for generating a flow of an aeriform substance that impinges on said heating elements (8).

8. The oven according to Claim 7, **characterized in that** said blowing elements (17, 17a) generate a flow of an aeriform substance that impinges on said heating elements, proceeding from above downwards.

9. The oven according to Claim 7 or Claim 8, **characterized in that** associated to said blowing elements (17, 17a) are deflecting elements (18) for conveying said flow of an aeriform substance, after the latter has impinged upon said heating elements (8), in a centripetal direction with respect to said chamber or bell (2).

10. The oven according to Claim 8 and Claim 9, **characterized in that** said deflecting elements (18) are set in a lower position with respect to said heating elements (8).

11. The oven according to any one of the preceding claims, **characterized in that** said heating elements (8) are selectively adjustable in terms of heating power.

12. The oven according to Claim 11, **characterized in that** the mouth part of said chamber or bell (2) has a polygonal profile with pairs of mutually opposite sides, and **in that** the heating elements (8a, 8b) associated to said pairs of opposite sides are adjustable in such a way as to cause the heating power of the heating elements (8a, 8b) associated to said pairs of opposite sides to be selectively higher or lower with respect to one another, or else to be substantially the same as one another.

13. The oven according to any one of the preceding claims, **characterized in that** said heating elements (8) are electrically supplied heating elements.

14. The oven according to Claim 13, **characterized in that** said electrical heating elements (8) are irradiating electrical heating elements.

15. The oven according to any one of Claims 1 to 12, **characterized in that** said heating elements (8) are gas-fired.

16. The oven according to Claim 15, **characterized in that** said heating elements are catalytic heating elements.

17. The oven according to Claim 8 and Claim 15, **characterized in that** said blowing elements (17, 17a) are configured for supplying, as aeriform substance, a comburent gas so as to obtain, at said gas-fired heating elements (8), a combustion in excess of oxygen.

18. The oven according to any one of the preceding claims, **characterized in that** said chamber or bell (2) carries, associated to it, means for discharging any humidity that may form in the chamber or bell (2) itself.

19. The oven according to any one of the preceding

claims, **characterized in that** said supporting structure (3) has a foot part (4) of a reduced vertical extension, so as to enable the installation, in a position between the foot part (4) of said supporting structure (3) and said chamber or bell (2), of a conveyor for the packages (P, A) which are to undergo treatment.

20. The oven according to any one of the preceding claims, **characterized in that** a guiding structure (16) is provided for enabling translation of the packages undergoing treatment, according to a general shuttle movement, between said treatment region and a position of loading and unloading of said packages, said loading and unloading position being generically at a distance from said treatment region.

21. The oven according to any one of the preceding claims, **characterized in that** said supporting structure (3) is provided with picking-up formations for enabling engagement of the oven (2) by a transportation vehicle with the aim of selective displacement of the oven (1) itself.

22. The oven according to any one of the preceding claims, **characterized in that** said supporting structure (3) presents a foot part (4) having a general channel conformation.

23. The oven according to any one of the preceding claims, **characterized in that** associated to the mouth part of said chamber or bell (2) is a floating structure (13) with associated thereto sensing means (14a) that are sensitive to the translation of said floating structure (13) with respect to the chamber or bell (2) ensemble; the arrangement being such that said floating structure (13) is able to detect a possible contact of said chamber or bell (2) with an obstacle during movement between said position of rest and said operating position.

24. The oven according to any one of the preceding claims, **characterized in that** it comprises a clamping element (15) capable of withholding said chamber or bell (2) in conditions of safety in said position of rest.

25. The oven according to Claim 24, **characterized in that** said clamping element (15) is configured for being selectively disengageable, with the aim of allowing movement of said chamber or bell (2) towards said operating position, only following upon a positive action of command.

26. The oven according to Claim 24 or Claim 25, **characterized in that** said clamping element (15) is configured for being selectively disengageable, with the aim of allowing movement of said chamber or bell (2) towards said operating position, only after said covering unit (10 or 12) has moved to the position in which the covering unit (10 or 12) itself disengages the mouth part of said chamber or bell (2).

27. The oven according to Claim 7 or Claim 15, **characterized in that** it comprises an economizer or recirculation circuit (101 to 106) for taking in (100) air from said chamber or bell (2) and reintroducing it (102, 17) into the chamber or bell (2) in a position corresponding to said heating elements (8).

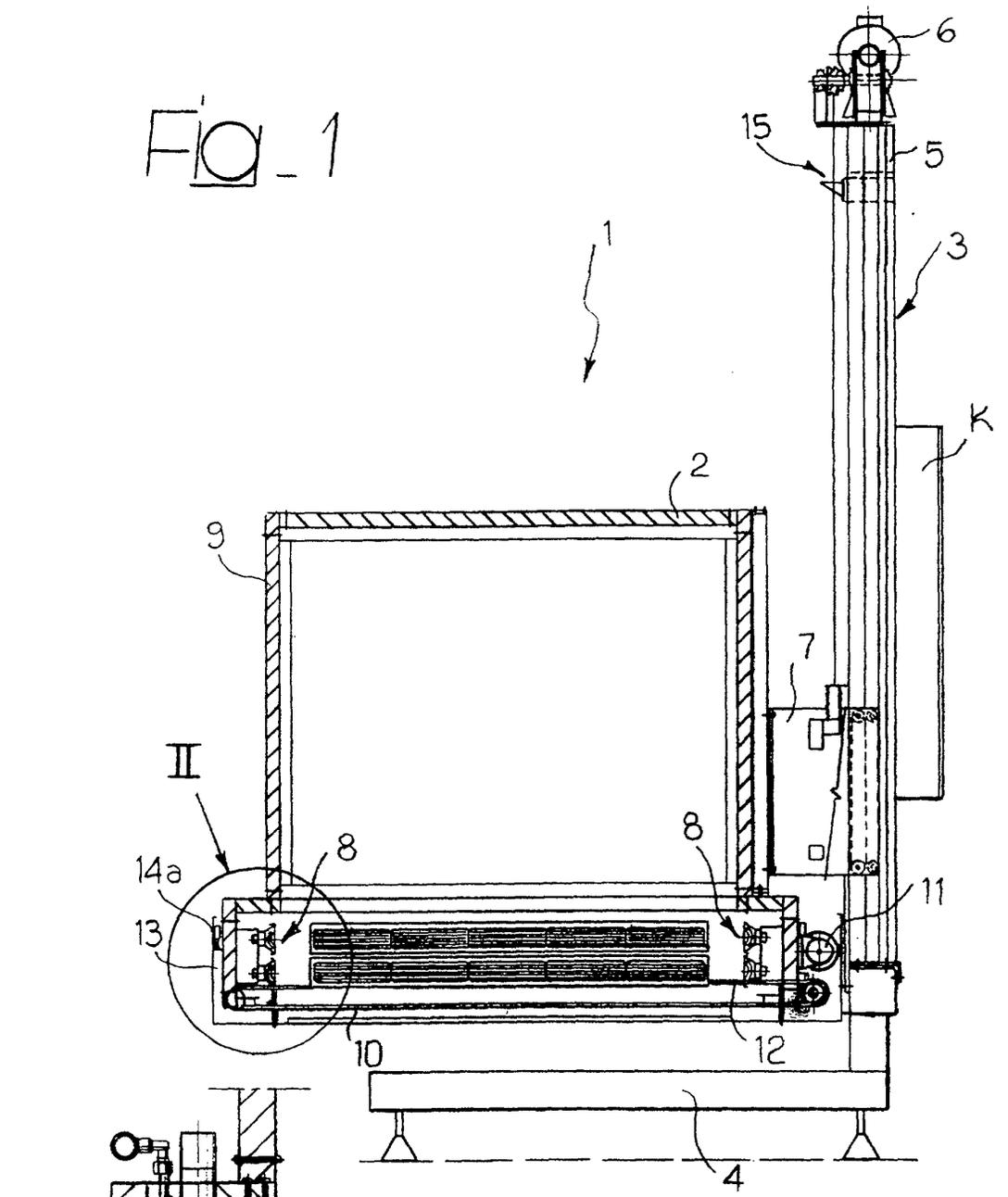
28. The oven according to Claim 27, **characterized in that** said air is re-introduced (102, 17) into said chamber or bell (2) starting from the bottom part of the latter.

29. The oven according to Claim 27 or Claim 28, **characterized in that** said economizer circuit comprises a pumping element (103).

30. The oven according to any one of Claims 27 to 29, **characterized in that** said economizer circuit comprises an inlet pipe (104) for delivering fresh air from outside.

31. The oven according to any one of Claims 27 to 30, **characterized in that** said economizer circuit comprises gate-valve means (105, 106) for selectively regulating the amount of air undergoing recirculation.

Fig_1



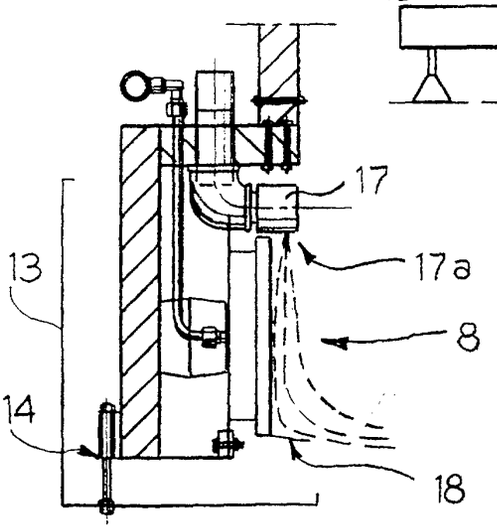


Fig_2

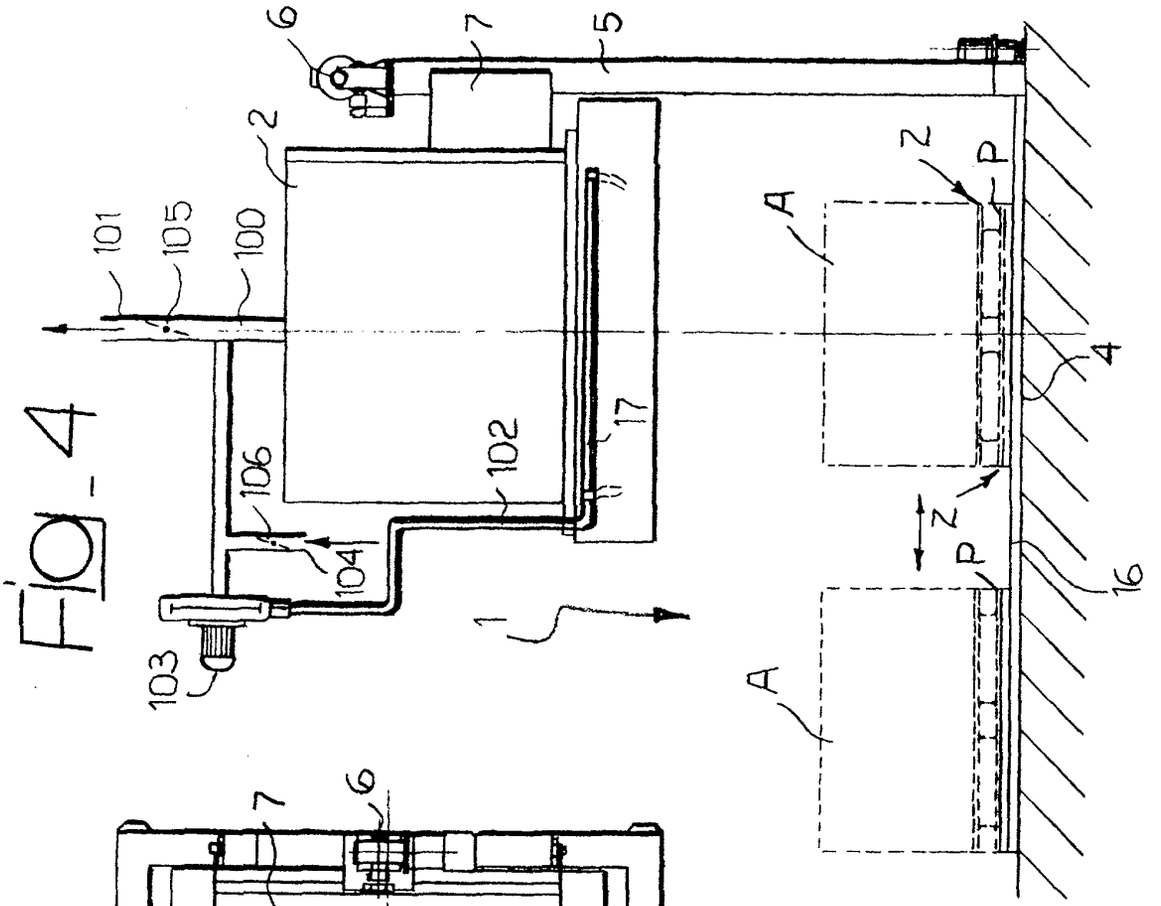


FIG_4

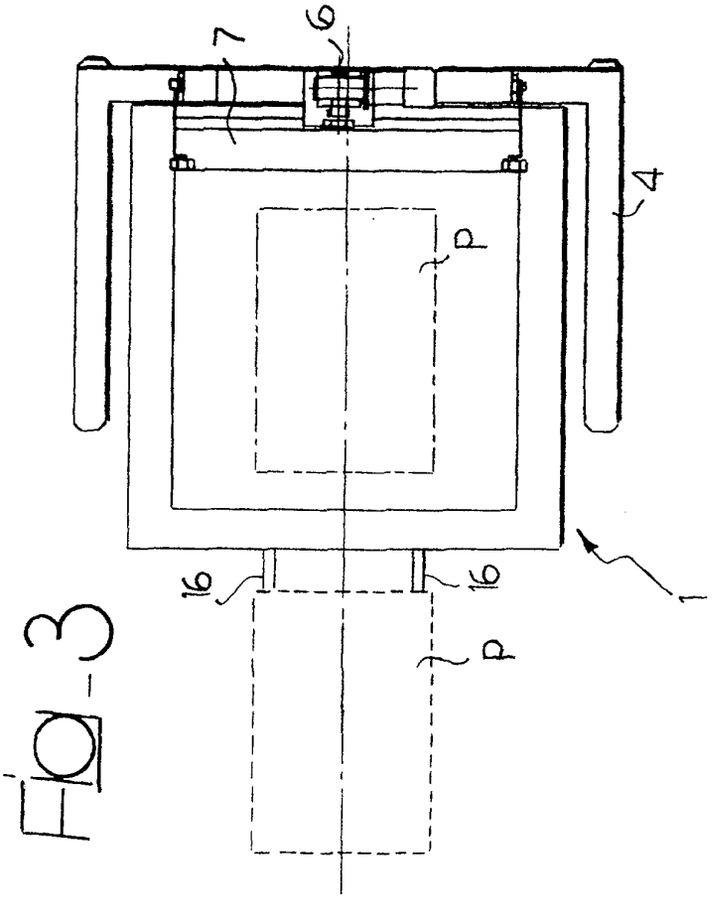


FIG_3

Fig_5

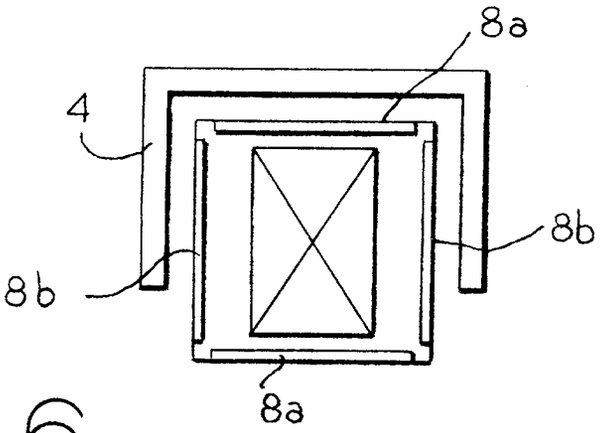


Fig_6

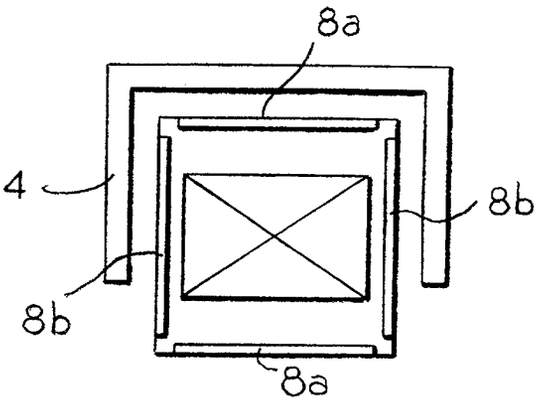
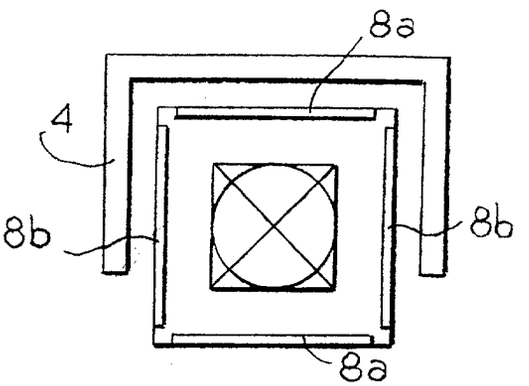


Fig_7



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 83 0229

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	FR 2 082 861 A (HURDEQUINT LOUIS) 10 December 1971 (1971-12-10) * page 1, line 24 - page 2, line 10 * * page 2, line 30 - page 5, line 10 * * figures 1-5 *	1,6,7,9, 10,13, 27-29,31	B65B53/06
A	---	2,5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B65B B29C

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 September 2001	Farizon, P

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)

European Patent Office

Application Number
EP 01 83 0229

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims 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 the first ten claims.

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:

1-5,6,7,9,10,13,27,28,29,31

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 01 83 0229

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: 1-5,6,7,9,10,13,27,28,29,31

   Closing unit

2. Claim : 8

   Blowing elements

3. Claims: 11,12

   Adjustable heating elements

4. Claims: 14-17

   Type of heating elements

5. Claim : 18

   Means for discharging humidity

6. Claims: 19,22

   Foot part of supporting structure

7. Claim : 20

   Guiding structure

8. Claim : 21

   Picking-up formations of supporting structure

9. Claim : 23

   Floating structure associated to the chamber

10. Claims: 24-26

    Clamping element

11. Claim : 30

European Patent Office

LACK OF UNITY OF INVENTION SHEET B

Application Number
EP 01 83 0229

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:

Inlet pipe for delivering fresh air from outside

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 01 83 0229

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.

10-09-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2082861 A	10-12-1971	FR 2082861 A5	10-12-1971

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82