(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 584 292 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.04.2013 Bulletin 2013/17

(51) Int Cl.:
F25C 1/04 *(2006.01)*

(21) Application number: **11425253.9**

(22) Date of filing: **17.10.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) Ice making machine with concealed water supply nozzles

(57) The present invention relates to an ice making machine, wherein a water supply device (1) with nozzles (11) sprays water towards an evaporator; the device provides a sliding wall (2) upon which the ice coming from the evaporator falls for being discharged, nozzles (11) are advantageously arranged on the wall (2) in a concealed manner, such not to hinder the ice from sliding on the wall.

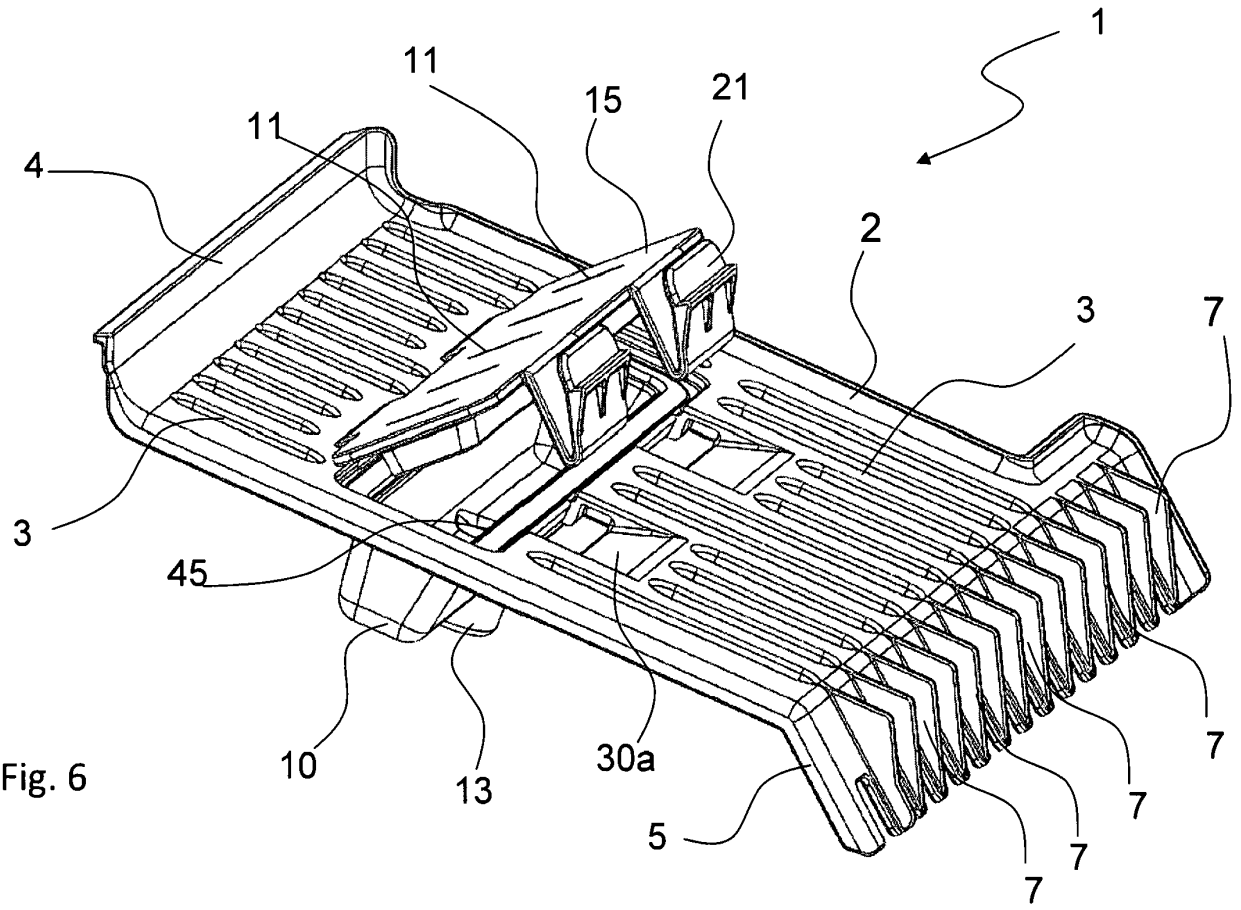

Fig. 6

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Description

[0001] The present invention generally relates to ice making machines, of the type usually employed for professional applications, such as for example commercial machines intended for making ice for food purposes in public places, restaurants and the like. Particularly, but not exclusively, the invention relates to machines for making ice cubes, this term meaning a generic shape of the ice suitable for being put into glasses, jugs and similar beverage containers, even if it is not geometrically perfectly cubic shaped.

[0002] Thus, for example, the invention is applied even in the case of pyramidal frustum, conical, spherical, full or even internally empty ice cubes.

[0003] As it is know, the above mentioned machines for making ice cubes comprise a refrigeration circuit wherein an evaporator is configured with the ice shapes to be obtained, thereby actually resulting in a mold for the ice upon which water to be frozen is supplied in order to produce ice.

[0004] In practice, there are two types of ice making machines depending on the manner water is sprayed onto the evaporator: a first type of machine is that wherein the water is supplied from above or fall supply, the water coming from a tank being supplied to the evaporator as a cascade.

[0005] The second type of machine, on the contrary, provides for the evaporator to be placed over a series of water spraying nozzles: therefore the ice cubes formed on it fall from the top towards a collecting area in the machine, where they can be taken by the users.

[0006] To this end it has to be pointed out that in both the above types of machines the operating cycle provides that once ice cubes are formed, the evaporator is quickly temporarily heated in order to remove them, usually by reversing the cycle of the refrigerant fluid such as to locally melt the ice and therefore to let the ice cubes falling down.

[0007] The present invention particularly relates to ice making machines wherein water is sprayed upwardly onto the evaporator; however the principles underlying the invention can be generally applied to all the ice making machines wherein there are provided water spraying nozzles and a surface upon which the produced ice drops or slides for being discharged.

[0008] An example of ice making machine provided with a device spraying water upwardly onto the evaporator is described in the international patent application PCT/EP2003/009679, whose fig.1 of the drawings is annexed here and shows some details thereof.

[0009] As it can be seen, the water supply nozzles come out from a chute where ice cubes fall and slide downwardly in order to be conveyed to a storage tank, where they can be picked up by the user.

[0010] Particularly, the nozzles and the relevant hydraulic circuit, that comprises several elements among which a manifold for distributing water to the nozzles connected by means of a conveying pipe to a pump, are made separately with respect to the cube sliding chute, thereby resulting independent therefrom.

[0011] For this reason the chute is provided with apertures where nozzles come out, that are in the form of holes placed over a water supply chamber, protrude.

[0012] The chamber extends above the surface of the cube falling chute, while the manifold that delivers water to the nozzles and the pipe for the connection to the pump are underneath the chute.

[0013] According to the disclosure of the international patent application already mentioned, the water spraying device can be provided with removable connection means with respect to the chute, so as to allow the nozzles to be removed for maintenance, repairing or replacement operations.

[0014] Even if from this point of view the machine known from the document PCT/EP2003/009679 has some interesting aspects, on the other hand its water spraying system is too cumbersome and not very appropriate, above all in the case of applications where there are reduced spaces, such as those available in machines making ice cubes with a big size or with such a size which does not allow to pass between the rows of nozzles.

[0015] Indeed, the supply chamber protruding from the chute for sliding the ice cubes, hinders the falling movement thereof, in particular if there are several nozzles placed side by side one to the other.

[0016] The ice cubes falling from above after being detached from the evaporator have to pass through a row of nozzles and the other, thus meeting an hindrance that slows down or stops the forward movement along the chute, thereby stopping the ice production and requiring a maintanance operation.

[0017] Moreover as regards the mechanical strength and reliability point of view, the structural configuration according to which the nozzle supply chamber is snap fitted with the sliding chute in such a manner to be removed, does not seem to be optimal since the resulting assembly appears to be exposed to differential thermal expansions that stress the connection of the several elements.

[0018] Indeed the ice cube sliding chute is in contact with the ice and therefore it is at a temperature generally lower than that of the nozzle supply chamber, and of the water storage manifold as well.

[0019] As a consequence, the inevitable vibrations during the operation of the machine and resulting from the operating cycle of the refrigeration circuit, can make the structure of the nozzles and/or of the ice cube falling chute unstable, with a noisiness and instability that are desirable to avoid.

[0020] The present invention aims to overcome such a situation; therefore it is an object of the invention that of providing an ice making machine equipped with a device for supplying water onto the evaporator through at least one nozzle, which has such structural and functional features as to overcome the above outlined drawbacks

with reference to the prior art.

[0021] The idea at the base of the invention is to make a machine where nozzles are associated to the chute, or more in general to a sliding wall for the ice detached from the evaporator, thereby being concealed with respect thereto.

[0022] Accordingly, the dropping and the forward movement of the ice are not hindered any more by the nozzles; moreover, the structure thereof is stiffened and therefore stronger from the structural point of view, since it is associated to the chute or ice falling wall.

[0023] The features of the invention are specifically set forth in the claims annexed to this description; such features, the advantageous effects deriving therefrom and the results of the invention will be come more apparent from the description of a preferred, non-exclusive, embodiment thereof, that is described below with reference to the annexed drawings wherein:

Fig.1 is, as already said, an example of an ice making machine according to the prior art;
Figure 2 is a perspective view of a water supply device, according to the invention;
Figure 3 is a side view of the device of figure 2;
Figure 4 is a view from the opposite side with respect to that of figure 3, of the water supply device of the invention;
Figure 5 is a side view of the supply device of figures 2-4, in a different operating condition, for example for cleaning the nozzles;
Figure 6 is a perspective view of the supply device of the invention, in the operating condition of figure 5;
Figures 7 to 10 are respective views of a detail with the nozzles of the supply device of the previous figures.

[0024] With reference to such figures, they show an example of device for supplying water to an evaporator, generally denoted by 1; the evaporator upon which the supply device 1 sprays water is not shown in the drawings since it is known per sè, as well as the remainder of the machine for making ice cubes wherein it is inserted, which is of the type described in the international patent application PCT/EP2003/009679 mentioned above.

[0025] In the following of the present description, for the sake of brevity the parts of the machine that are not related to the invention or that are not necessary for the comprehension thereof, will not be considered and for further details reference should be made to what already known in the art, for example from the international patent application already mentioned above.

[0026] The supply device 1 comprises a sloping wall 2 for sliding or dropping the ice cubes, which in this embodiment has a mainly flat profile such to take the shape of a chute upon which the ice cubes can slide.

[0027] However the wall 2 might have a configuration different from the flat one, for example a convex or slightly concave one, or a combination of these configurations such as to have a wave-like profile or, more generally a curved profile, suitable for guiding the ice to slide thereon; to this end the wall 2 is inclined as it can be seen in the figures.

[0028] According to this embodiment, the wall 2 is characterized by a series of longitudinal slots 3, which lighten the structure thereof, streamline the ice sliding along the wall to be conveyed and help water sprayed by the device to be discharged.

[0029] Moreover, the upstream end 4 of the sliding wall 2 is shaped with an upwardly extending concave edge, which allows it to be engaged by a projection or undercut of the inner wall of the chamber where the device 1 is fitted, which differs with regards to this feature from the one of PCT/EP2003/009679 that, on the contrary, is smooth. The end 4 shaped in such manner allows the device 1 to be fastened by a simple snap fit or engagement, namely without screws or without any other fastening means like it occurs in the already mentioned prior art.

[0030] The downstream end 5 of the sliding wall 2 is inclined downwardly and it has a series of notches 6 that cause the edge to have a comb-like profile; notches are separated by corresponding partitions 7, which are advantageously provided as abutment elements for fringes provided at the end of the wall 2 and intended to act as a barrier dividing the cold environment inside the machine from the external one at room temperature (such fringes are usually made of plastic or the like and are also provided in the known machines as it can be seen in fig.1 at the end of the sloping surface; they are also called as "flags" by people skilled in the art).

[0031] According to a preferred embodiment of the invention, the partitions are arranged so as to be staggered with respect to the slots 3, such as to help the water to be discharged.

[0032] The sliding wall 2 for the ice cubes is preferably made of plastic material, like also the other elements of the device 1 that will be better explained below; to this end the embodiment thereof shown in the drawings lends itself advantageously to be obtained by molding of suitable plastic material, such as polyvinyl chloride (PVC), ABS (acrylonitrile butadiene styrene) high or low density polyethylene (HDPE or LDPE), nylon and other polymers suitable for being applied on machines for making ice intended for food purposes.

[0033] The device I is further provided with a manifold 10 for conveying water to a series of nozzles 11, which is made as one piece with the sliding wall 2.

[0034] The manifold 10 is essentially a tank or a container extending transverse to the wall 2 in a substantially median region thereof, and it is provided with an inlet aperture 12 for the water coming from the hydraulic circuit, not shown in the drawings, of the ice making machine; a sleeve 13 extends at the aperture 12 for the connection with pipes of the hydraulic circuit of the machine.

[0035] The tank of the manifold 10 is closed at the top

by a cover 15 where spraying nozzles 11 are made.

[0036] As it can be seen, the cover 15 is substantially configured as a flat plate with a shape corresponding to that of the collector 10 below (that in this case is rectangular), so that in the description below and in the following claims both names will be used; hooking means 20 and 21 are provided respectively along the upstream and downstream edges thereof, with reference to the corresponding ends 4, 5 of the plate 2.

[0037] In the example the upstream hooking means 20 are appendages with curved ends 20a, such that they contemporaneously act for attaching the cover 15 to the wall 2, and as a hinge for pivoting the cover upon its opening and closure.

[0038] On the other hand, along the downstream edge of the cover 15 there are provided tabs 21, which are upwardly bent such as to have an elastic bending behaviour in order to help the cover to be opened and closed. For this purpose projections 21 a are provided on the bent tabs 21 for attachment to the cube sliding wall 2.

[0039] To this end the latter is provided at the manifold 10 with a pair of seats 30 for the engagement of the tabs 21: as it can be better seen in the drawings of figures 3 and 6, seats 30 are composed of apertures with a leading surface 30a which is inclined such as to define an undercut against which the hooking projection 21 a of the tabs 21 abuts; the flexibility thereof, due also to their bent configuration, allows an easy engagement and disengagement to be accomplished for correspondingly closing and opening the cover 15.

[0040] For this reason it is sufficient to exert a slight pressure with the fingers of the hand such as to bend the tabs and to release the projection 21 a from the engagement with the corresponding seat 30.

[0041] According to a preferred embodiment of the invention, the water supply nozzles 11 are provided in the cover 15: thus they are advantageously incorporated in the cover and concealed with respect to the ice cube sliding wall 2.

[0042] On the lower face of the cover, that is the one facing the tank of the manifold 10, there are provided supply chambers 33 at the nozzles 11, which act for conveying the water to the nozzles and obtaining a uniform and regular spray.

[0043] According to this embodiment, the nozzles 11 have the shape of through slits in the cover 15 and the water spray coming out from them takes a fanwise shape which can be seen in figure 4, that hits all or almost all the width of the evaporator above.

[0044] The operation of the water supply device described above is as follows.

[0045] Water coming from the hydraulic circuit of the ice making machine is supplied to the manifold 10 that, as already said, is connected to the pipes of the above mentioned hydraulic circuit, in connection with the sleeve 13; the hydraulic circuit is of the type known per sè, for example like that of the international patent application mentioned above, and it provides a pump that supplies water at a predetermined pressure to the collector 10.

[0046] The pressurized water therefore flows into the supply chambers 33 associated to the nozzles 11, from which it is sprayed upwardly against the evaporator (not shown in the drawings) where it freezes, thereby forming the cubes.

[0047] By reversing the thermal cycle of the machine, as already explained above, the cubes are detached and drop on the sliding wall 2 which is slightly sloped, as it can be seen in the side views of the figures.

[0048] The ice cubes dropping from the evaporator on the sloping wall 2 do not find any obstacles in their sliding path towards the downstream end 5 of the wall, since the latter is completely smooth, except for the provision of longitudinal slots 3 which however help the guided sliding of the cubes towards the downstream end 5.

[0049] The water sprayed by the nozzles 11 and that has not been frozen on the evaporator is easily discharged through the slots 3 of the sliding wall 2, while the remaining water flows towards the notches 6 that act as discharge outlets.

[0050] From what described up to now it is easy to understand how the machine according to the invention achieves the objects set forth at the beginning and that are at the base of the invention.

[0051] Indeed, as explained above, the nozzles 11 are associated to the sliding wall 2, thereby resulting concealed and not hindering in any manner the sliding movement of the ice cubes; moreover, it has to be noted how, from the functional point of view of the water supply, the performances of the device I according to the invention are enhanced by the manufacture of the supply chambers 33, which even if are made on the cover 15 they are actually placed within the collector 10 and not outside it as, on the contrary, occurs in the prior art.

[0052] Accordingly, even the overall dimensions of the device 1 determined by those of the nozzles 11, of the supply chamber 33 and of the manifold 10, are highly reduced by the solution of the invention.

[0053] It has to be added to the above that the fact that nozzles 11 are made in the manifold cover, and more generally, concealed with respect to the ice sliding wall 2, allows them to be flush with the surface where the cubes move even when it is curved or anyway not flat, as the one of the example shown in the annexed drawings.

[0054] It is clear that the cover 15 can be shaped depending on the profile of the wall 2, therefore it is also curved (concave and/or convex) depending on needs.

[0055] Moreover it should not be ignored the simplification from the manufacturing point of view achieved by the invention, where the nozzles are made in the cover 15 closing the manifold 10, which allows the sliding wall 2 with the manifold and the cover 15 to be industrially made easily by plastic material molding, such that only two pieces have to be made which are assembled rather easily as described above. Here it suffice to add that preferably between the cover 15 and the edge of the tank of

the manifold 10 a watertight seal 45 can be provided that prevents the water supplied under pressure into the manifold from leaking out.

[0056] Another important result achieved by the invention is the fact that the cover 15, and more generally, the supply device 1 does not require the use of screws, bolts and other fastening means for being assembled.

[0057] Accordingly the maintenance of the nozzles 11 and of the device 1 is highly facilitated since screwdrivers, clamps and other tools are not necessary, since all the components are simply coupled or snap fitted one with the other: in practice, for the maintenance it is possible to remove the cover 15 and to have access to the manifold 10 and to the nozzles 11.

[0058] Obviously variants of the invention are possible with respect to what described up to now.

[0059] It has been already said as regards the configuration of the sliding wall 2, how it has not to be necessarily flat as the shown one; the same is also valid for the cover 15 where nozzles 11 are obtained, which can have a non flat shape that is a curved or generally rounded one.

[0060] However, as regards the nozzles it is possible to have a configuration different from the slits of the shown example, it being possible for them to have the shape of holes or even circular crown such to obtain more appropriate water jets, depending on the evaporators of the ice making machines where the device of the invention is fitted. Here another advantage achieved by the invention has to be pointed out, namely the fact that the nozzles can be easily replaced by simply changing the cover 15; in other terms, it is possible to keep in stock covers with nozzles formed therein according to the different shapes mentioned above, such that depending on the manufacturing needs of ice makers, the latter can be provided with the required nozzle by simply applying one cover or the other type.

[0061] Moreover it has to be pointed out that although the plastic material for making the parts of the supply device 1 is doubtless the preferred one, the use of other materials has not to be excluded, such as for example metal materials, for making at least partially the sliding wall or the cover with the nozzles.

[0062] As regards also the nozzles variants are possible with respect to the solution considered above.

[0063] Although the latter is to be preferred since it is composed of a simple through aperture in the cover 15, in the form of slot, hole or the like, that can be made by a mechanical processing or even during the plastic material molding process for the cover, however it can be understood that separated nozzles can be used to be applied on the cover.

[0064] That is to say that metal nozzles or anyway nozzles not as one piece with the cover can be provided, to be applied into seats (e.g. holes) formed therein.

[0065] However all these variants fall within the scope of the following claims.

Claims

1. Ice making machine, comprising a water supply device (1) wherein at least one nozzle (11) sprays water towards an evaporator, a wall (2) upon which the water from the evaporator slides for being discharged, **characterized in that** said at least one nozzle (11) is associated to the wall (2) in a concealed manner thereby not hindering the ice sliding on the wall.

2. Machine according to claim 1, wherein said at least one nozzle (11) is substantially arranged so as to be flush with the profile of the ice sliding wall (2).

3. Machine according to claims 1 or 2, wherein said at least one nozzle (11) is removably associated to the sliding wall (2).

4. Machine according to any claims 1, 2 or 3, comprising a water storage manifold (10) for said at least one nozzle (11), associated to the ice sliding wall (2).

5. Machine according to any of the preceding claims, wherein said at least one nozzle (11) is arranged in a plate (15) removably applied on the ice sliding wall (2).

6. Machine according to claim 5, wherein the plate (15) is substantially a cover closing the manifold (10) or a part thereof.

7. Machine according to any claims 5 or 6, wherein the plate (15) comprises hooking means (20, 21) engaging into corresponding seats (30) of the sliding wall (2), for applying the plate (15) to the wall (2).

8. Machine according to any claims 5, 6 or 7, wherein projections are provided on the face of the plate (15) which define at least a chamber (33) for supplying water to a corresponding nozzle (11).

9. Machine according to any claims 5 to 8, wherein said at least one nozzle (11) comprises a through aperture in the plate (15).

10. Machine according to any of the preceding claims, wherein the sliding wall (2) comprises slots (3) extending lengthwise thereto.

11. Machine according to any of the preceding claims, wherein the sliding wall (2) is substantially flat with an upwardly projecting upstream end edge (4), with reference to the sliding direction of the ice, and a downwardly projecting downstream end edge (5).

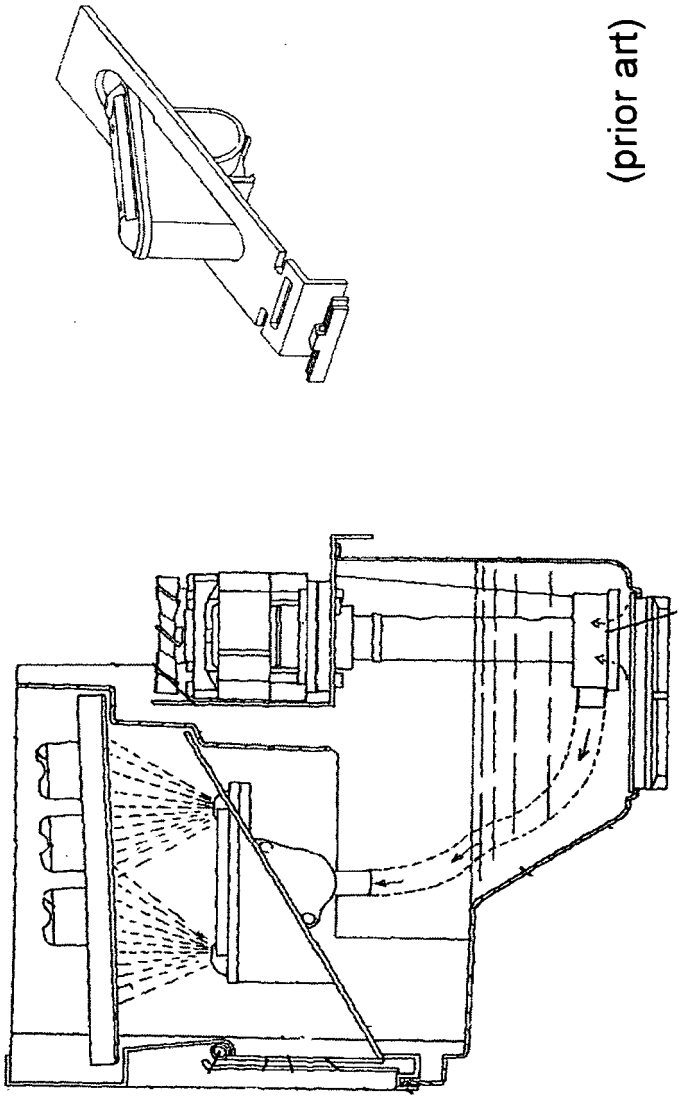
12. Water supply device for an ice making machine, comprising a wall (2) upon which the ice coming from

an evaporator slides, **characterized in that** the nozzles (11) comprise through apertures into a plate (15) with a profile flush with that of the wall, such that the nozzles are concealed with respect thereto.

13. Device according to claim 12, wherein said apertures are made according to one or more of the following configurations: holes, straight, curved or combined slits.

14. Device according to one claim 11 or 12, wherein the sliding wall (2) and a water storage manifold (10) are made as one piece of plastic material.

15. Device according to claim 14, wherein also the plate (15) is made of plastic material.



(prior art)

Fig. 1

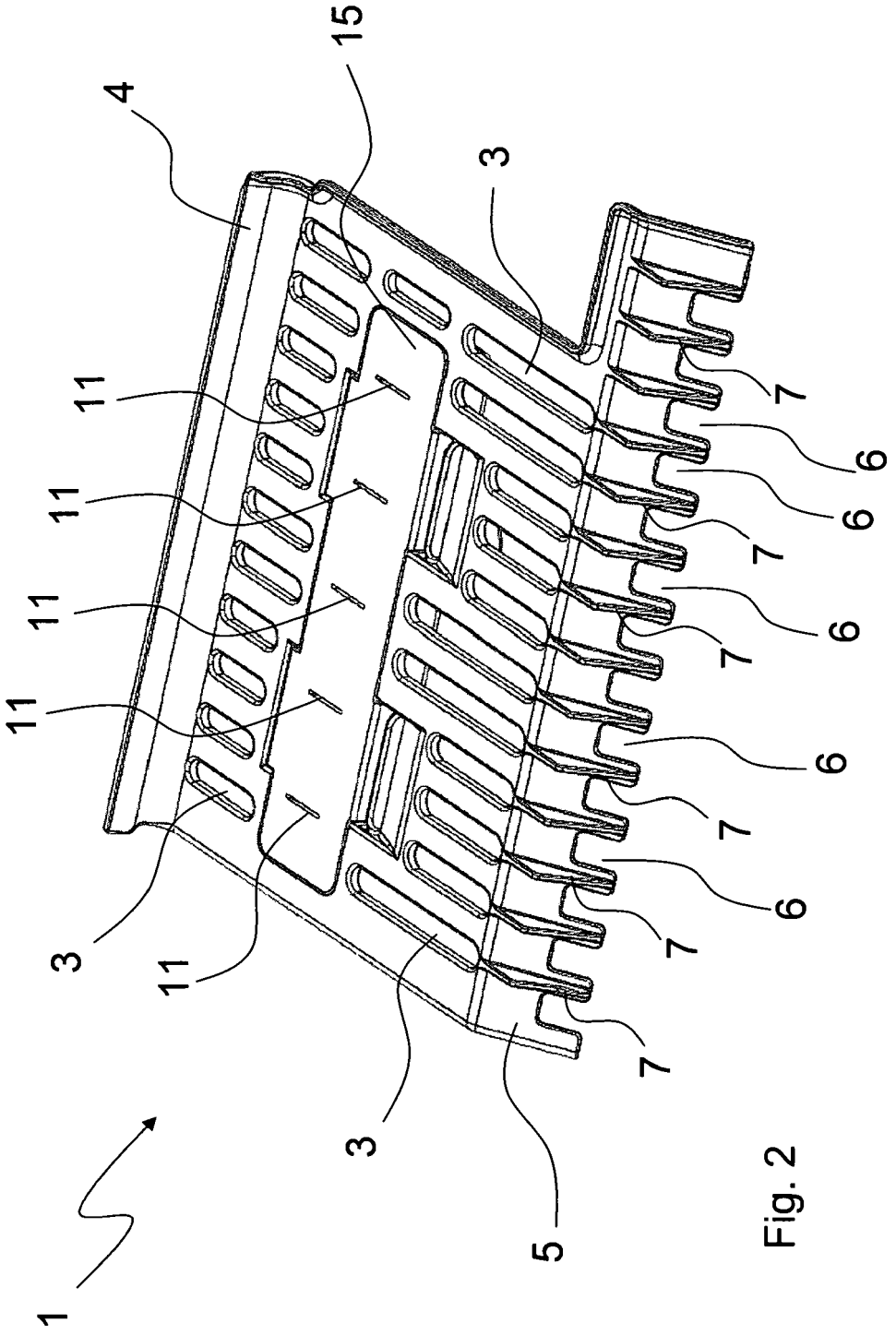


Fig. 2

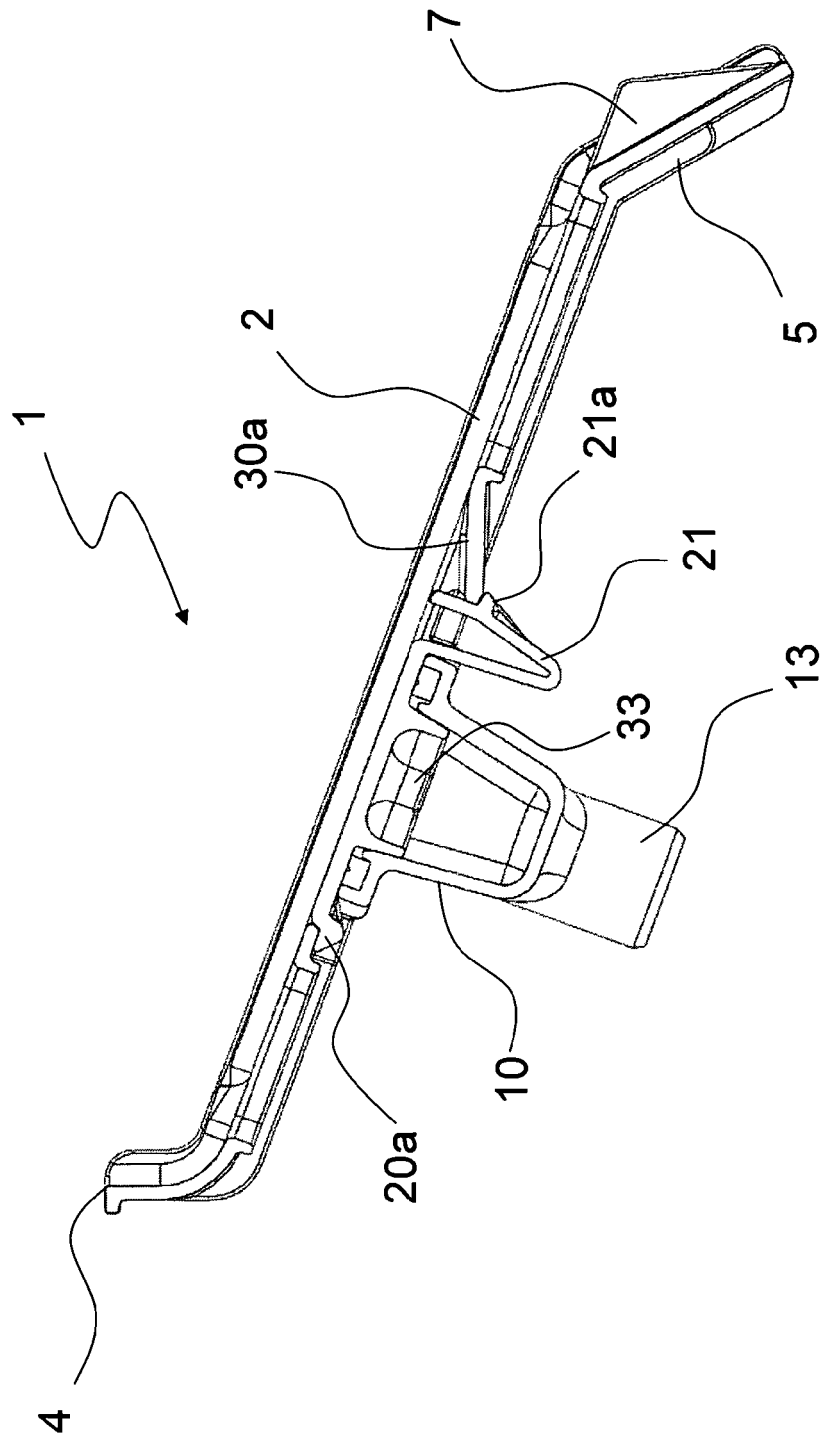


Fig. 3

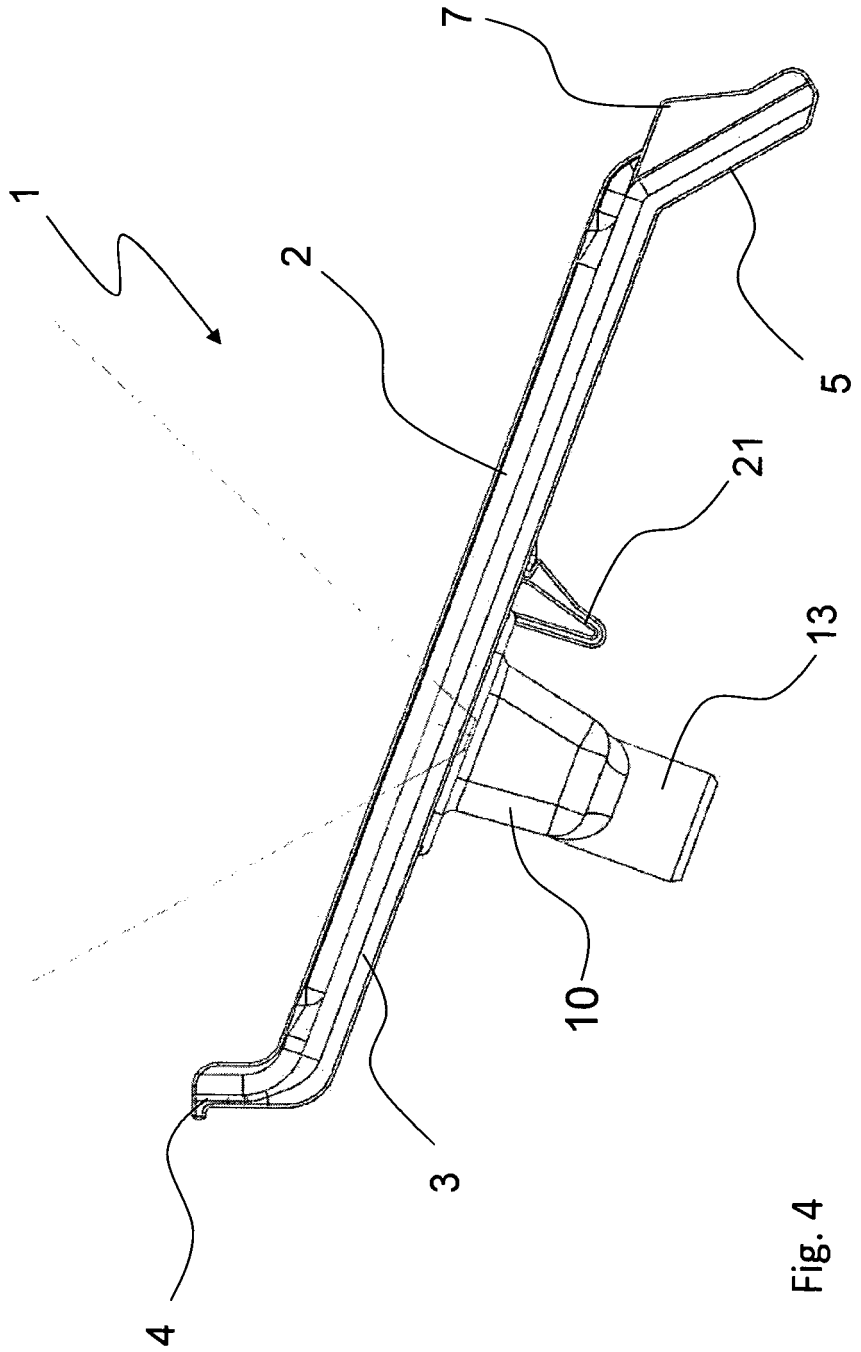


Fig. 4

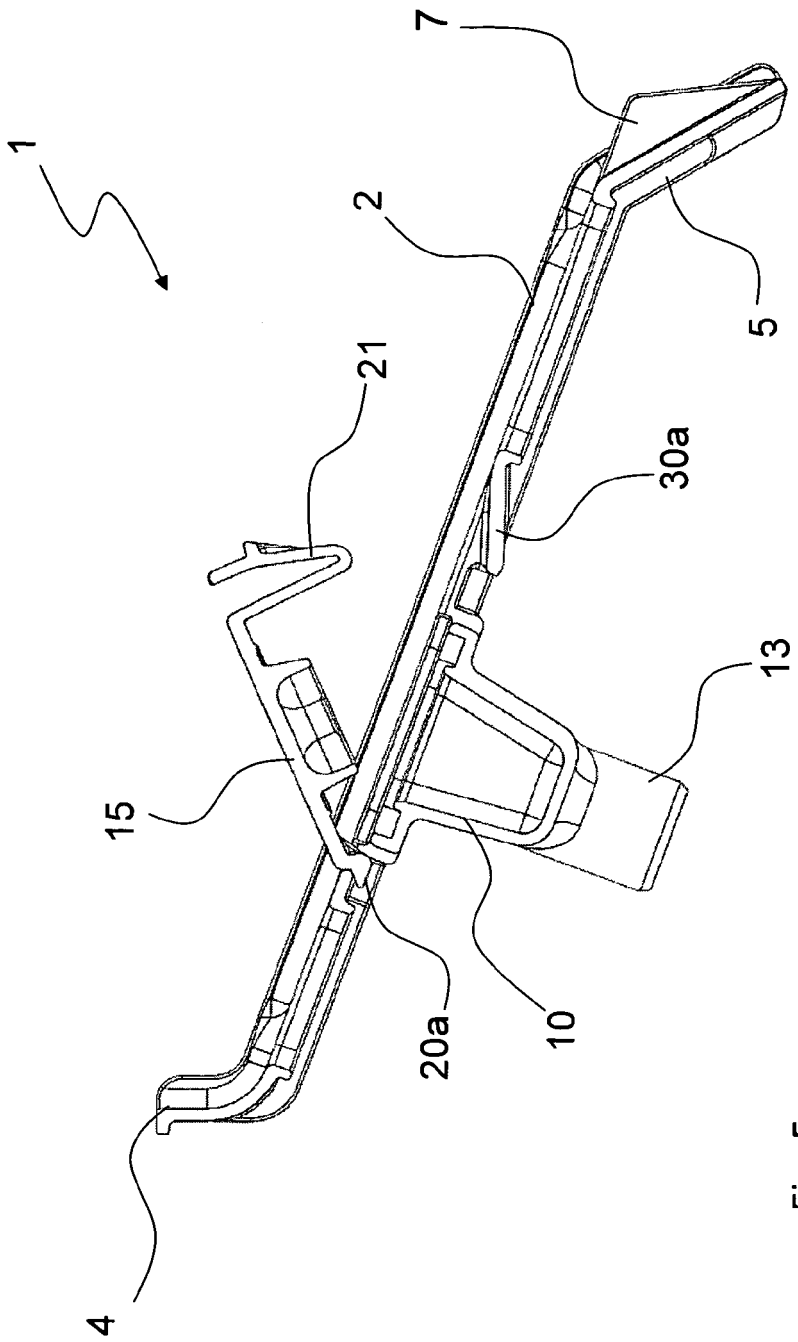


Fig. 5

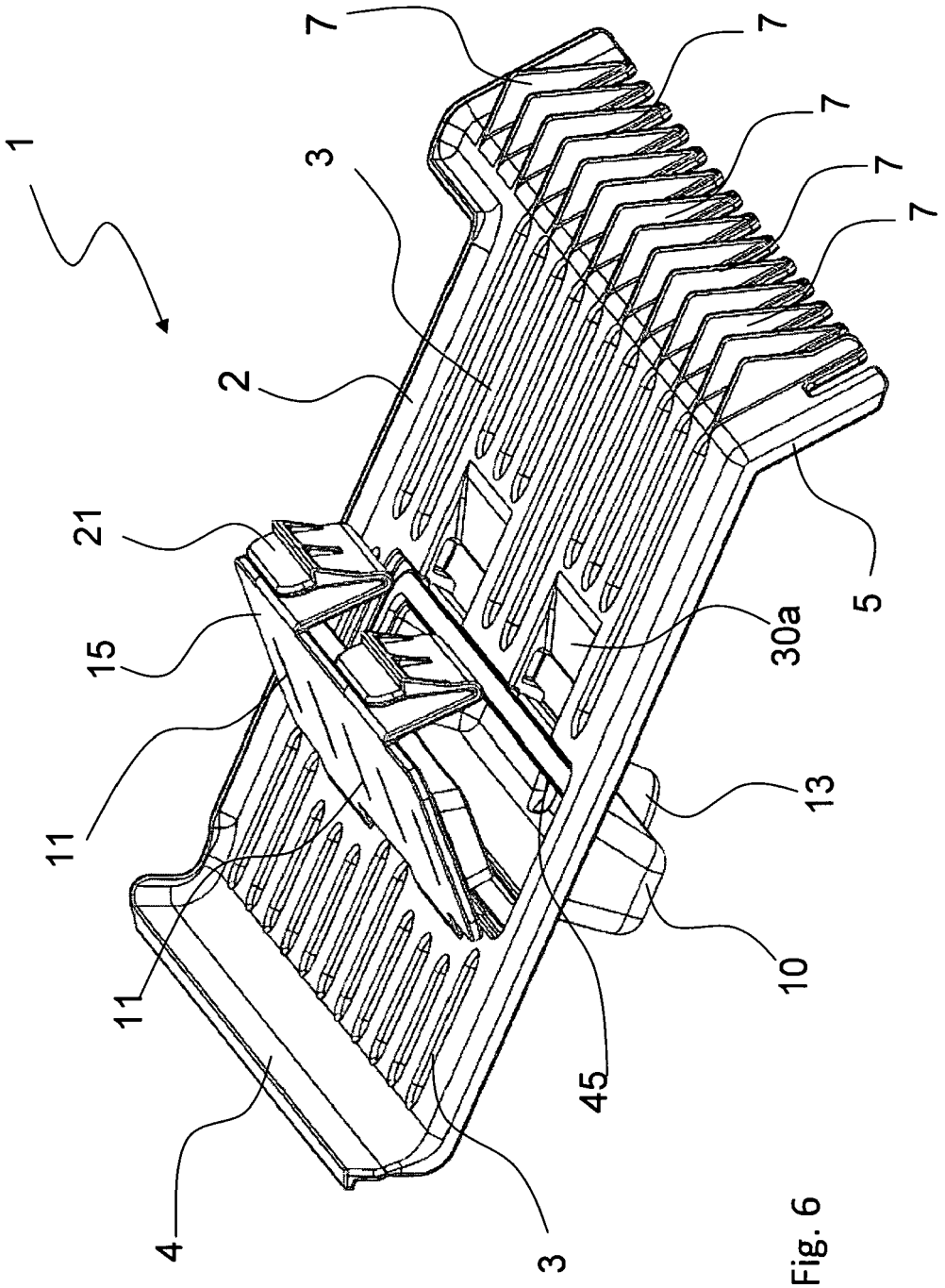


Fig. 6

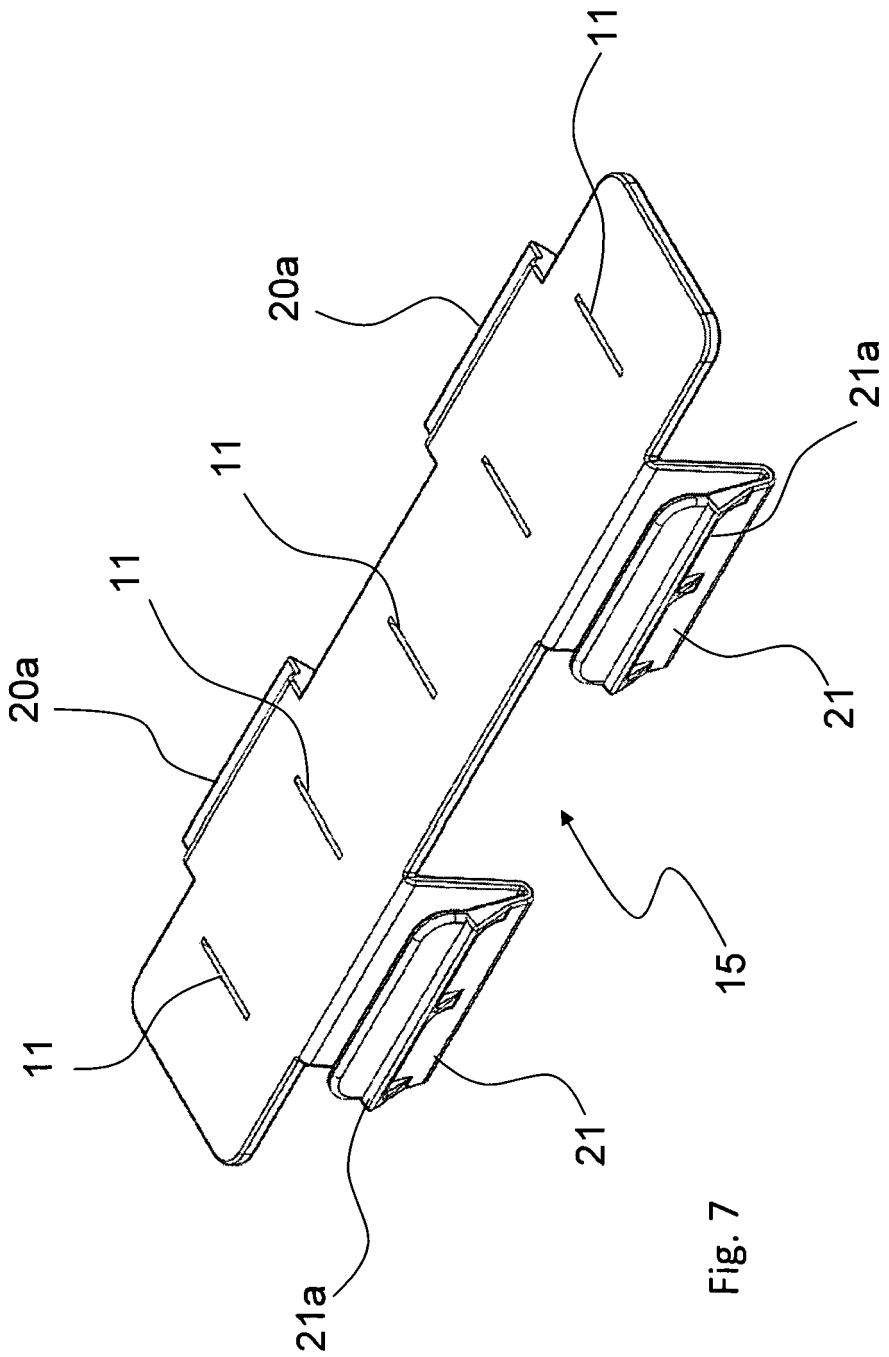


Fig. 7

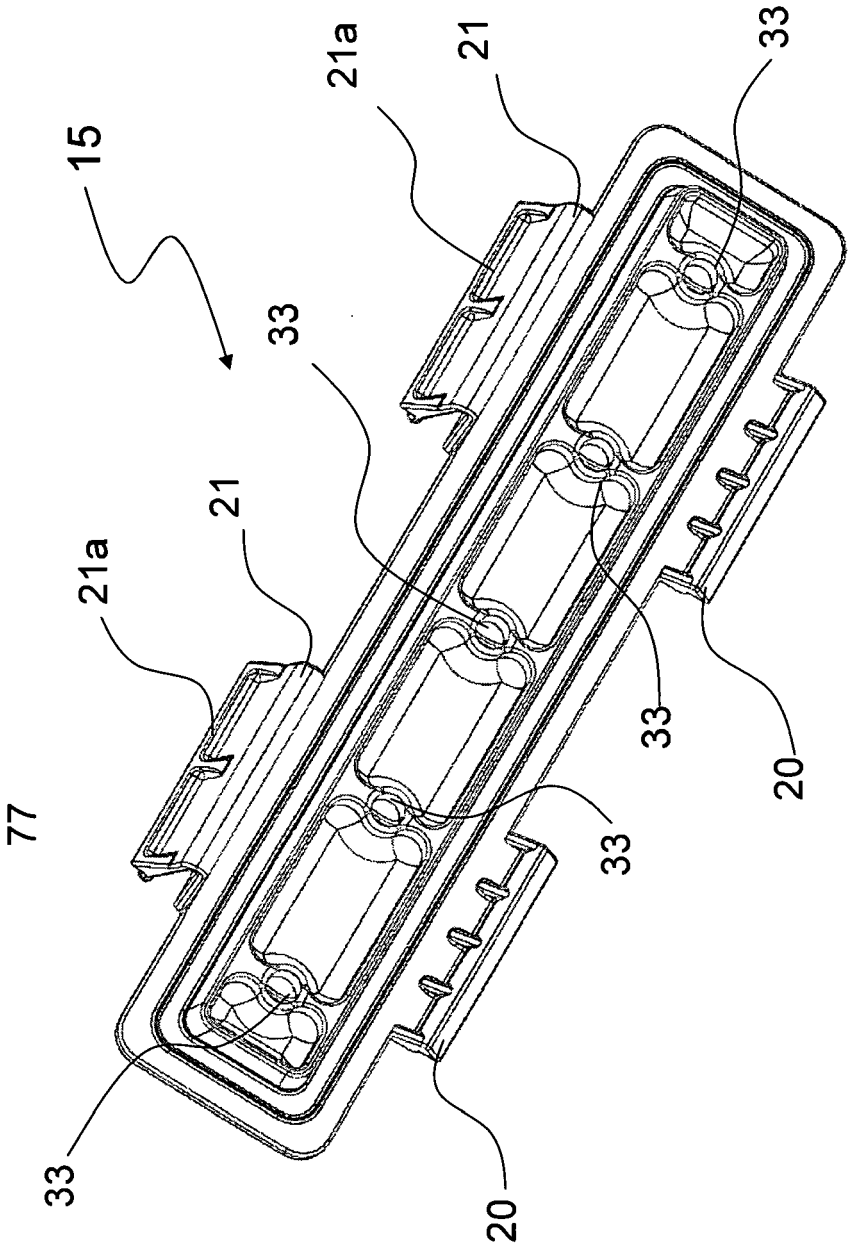


Fig. 8

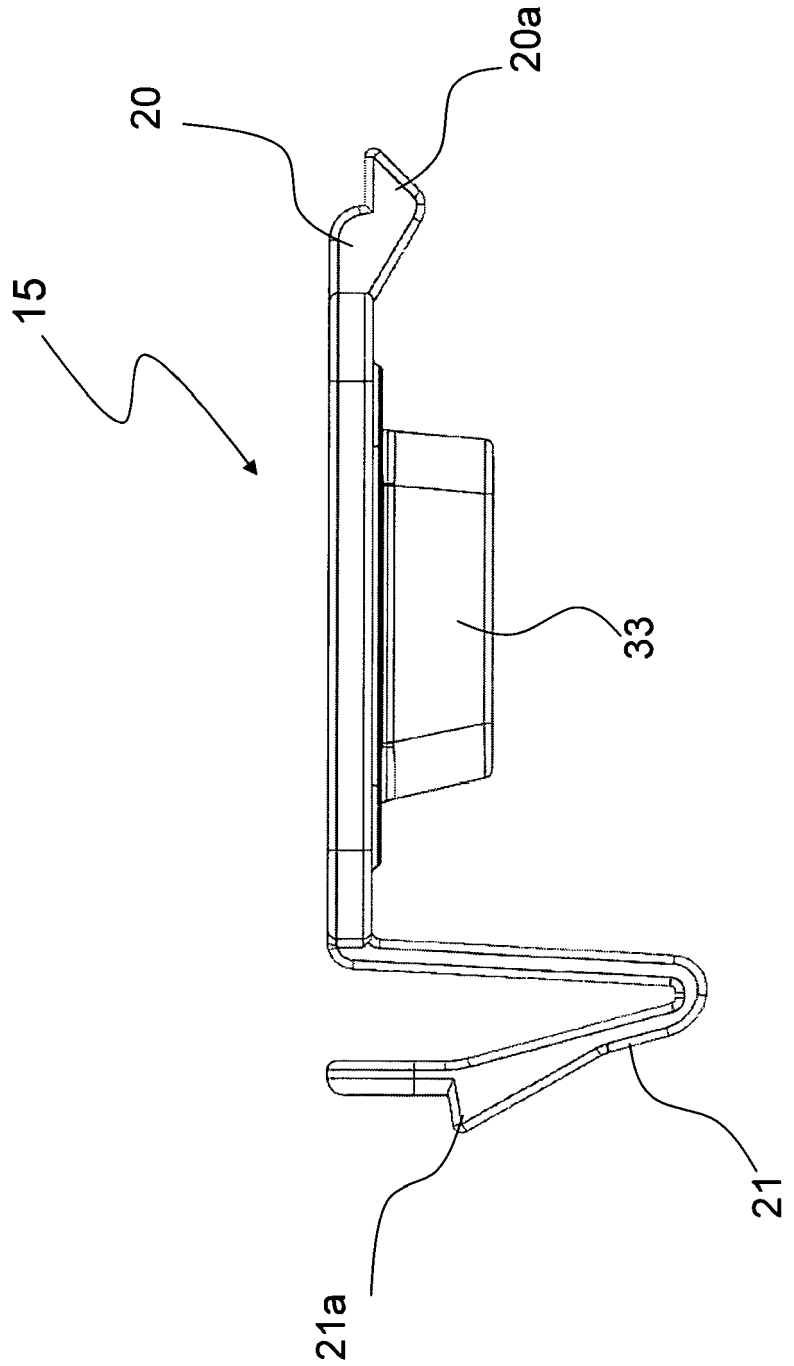


Fig. 9

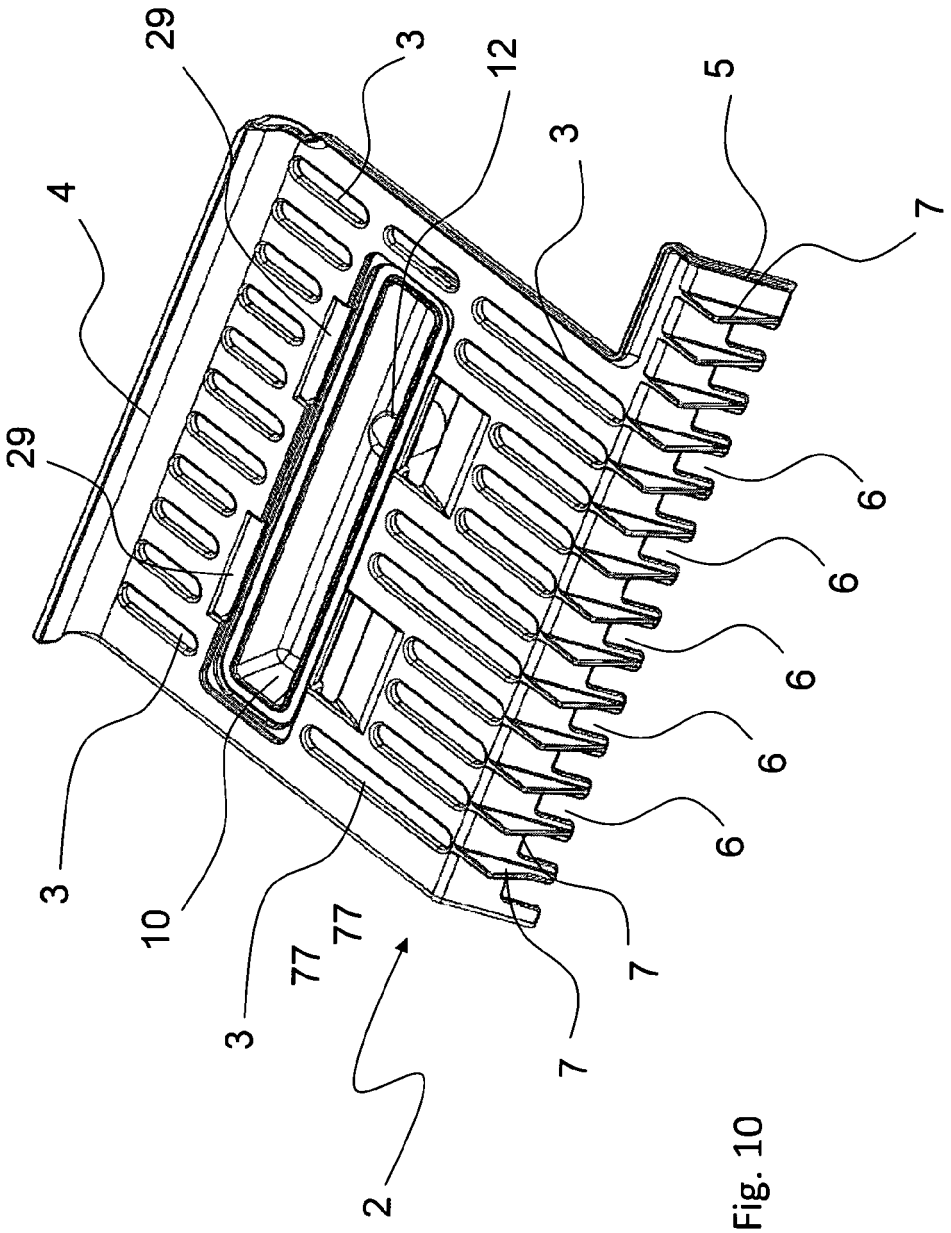


Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 11 42 5253

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 467 163 A1 (HOSHIZAKI ELECTRIC CO LTD [JP]) 13 October 2004 (2004-10-13)	1,2,4,10	INV. F25C1/04
A	* paragraphs [0015], [0031] - paragraph [0032]; figures 1-3,5-6 *	12	
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TECHNICAL FIELDS SEARCHED (IPC)

F25C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 March 2012	Jessen, Flemming

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 42 5253

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
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14-03-2012

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

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