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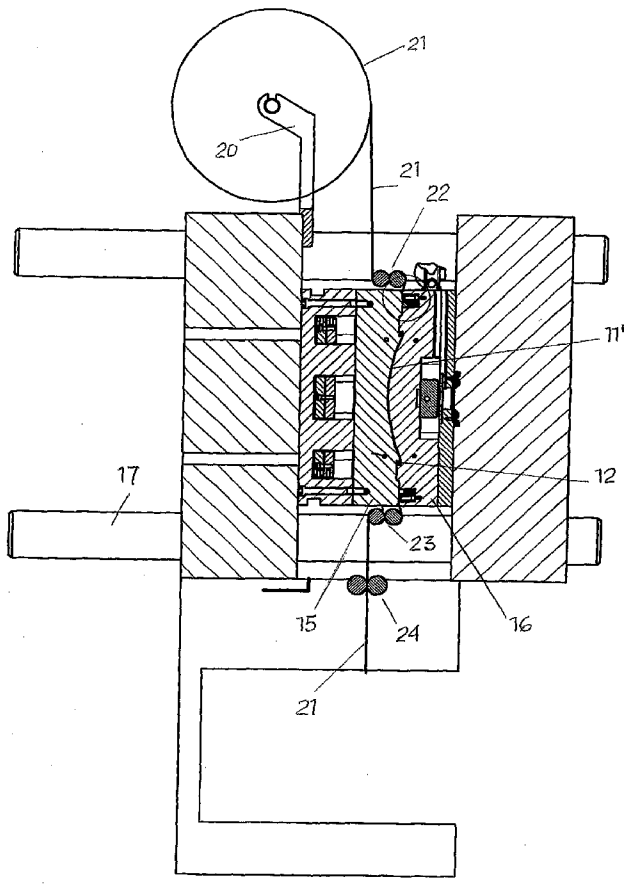
(54) **Title:** METHOD AND EQUIPMENT FOR THE FORMATION OF MANUFACTURED ARTICLES INCORPORATING A NET MEMBER



(57) **Abstract:** This invention concerns a process and equipment for the construction of articles (10) incorporating a net member (11) in a plastic frame and perimetral edge (12), in particular seats and/or backrests for chairs. The article is made using a mould(14) of a plastic injection moulding machine(13), by positioning in the open mould a length of initial net material (21), held and stretched in orthogonal directions; the length of net material being blocked in the mould at the same moment it is closed; injecting plastic into the closed mould to form an overmoulded frame or perimetral edge and incorporating a corresponding part of the length of net; and then opening the mould to extract the article and for a simultaneous or successive trimming of the parts of the superfluous net protruding from the frame or edge of the article.

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"METHOD AND EQUIPMENT FOR THE FORMATION OF MANUFACTURED ARTICLES INCORPORATING A NET MEMBER"

* * * *

Field of the Invention

This invention concerns in general the chair sector composed of plastic components, and refers in particular to a method and equipment for the construction of manufactured articles incorporating a net member and designed to make chair seats and/or backrests.

State of the Technique

Chairs having a seat and/or backrest incorporating a net member, usually a high tension plastic material, which defines the seat area to sit on, are already well known.

According to a method of construction, the net member is fixed directly to the chair frame in correspondence with the seat and/or backrest, partially by welding and partially by means of an adhesive, as made disclosed, for example, in the document JP-2004057646. The solution is however complex and not very practical to achieve, and the result is immaterial.

According to another method, the net member is stretched over, folded and fixed to a frame or perimetral edge, and this is then used by fitting and/or fixing it by means of screws into a corresponding groove provided in the chair frame around the seat and/or backrest, as disclosed, for example, in document EP-1552771. In this case however, it is necessary also to construct the frame in correspondence with the seat and/or backrest so that it can fit

into the frame or edge holding the net member.

In another construction method, such as is disclosed in US-6125521, the edges of the net member are embedded, by overmoulding, consequently retained, in a frame or perimetral border made of a plastic material. According to this procedure, the net member is firstly held and stretched, longitudinally and crossways, between the stretching organs of a loom; then while it is still stretched, it is sandwiched between two opposite members of a supporting frame positioned between mould members of a moulding machine; successively, after having been released by the moulding machine, the net member is trimmed of the excess membrane around the carrier member; then the carrier member with the net member is placed between two open mould-halves of the injection moulding machine in which, following the closure of the mould-halves, the overmoulding of the frame or perimetral edge is carried out on the element inside said frame; finally, after opening the mould members and extracting the manufactured article, the supporting frame is unblocked and removed and the net member is trimmed around the frame or perimetral edge.

This procedure however seems inconvenient at least due to its complexity and low productivity and also because, an injection moulding machine for the overmoulding of the frame or perimetral edge on the net member, a loom for stretching the initial net, a frame to block and temporarily support the stretched net member, and means for positioning and extracting the frame each time to and fro from the mould-halves of the moulding machine, are also needed.

Objects and Summary of the Invention

One of the objectives of this invention is to create the conditions to avoid the problems and weaknesses of the technical note, by actually simplifying the construction procedure, in particular but not exclusively, of finished articles, such as chair seats and backrests, including a net member, and this without having the need for additional machines and to have to fix beforehand the net member to a temporary supporting frame.

Another objective of the invention is therefore to provide an innovative procedure for the construction of at least articles of the type mentioned previously, which is carried out completely, starting from the contribution of the net, within the sphere of the injection moulding machine for the overmoulding of the frame or border of the net member.

Yet another objective of the invention is to provide an apparatus which can be applied to an injection moulding machine for plastic items at least for making articles, in particular chair seats and backrests, incorporating a net member.

A further objective of the invention is to provide a machine for injection moulding of plastic items equipped for the production of articles, such as chair seats and backrests, incorporating a net member.

According to a first aspect of the invention a manufacturing process is proposed for the production of articles, in particular chair seats and/or backrests, incorporating a net member with a plastic frame and perimetral edge, comprising steps to:

prepare an injection moulding machine for plastics with a mould made

up of two mould-halves moving in unison to open and close the mould and forming, when closed, an impression corresponding to the frame or edge of the article;

place and position in the mould, when open, a length of the initial net, held and stretched at right angles, facing one mould-half, said length of the net measuring in length and width sufficient to extend beyond the external edges of the impression in said mould;

close the mould, blocking the net at the same time against other mould- half ;

inject in the impression defined by said closed mould a plastic material to form an overmoulded frame or perimetral edge and incorporating a corresponding part of the net;

open the mould to extract a semi-finished article by first trimming crossways a length of the net extending beyond the frame or edge of the article.

This last step of the process can be preceded by trimming the length of the net around the frame or perimetral edge directly when still in the machine. As an alternative, after being extracted from the mould, the article can be picked up so as to trim the part of the net extending beyond the frame or perimetral edge using appropriate means external to the machine.

Advantageously, the net at the start is shaped like a continuous band and the length fed each time between the two open mould-halves is unwound at intervals and cut from a roll of net positioned near the mould. The length of the initial net positioned between the two mould-halves is held and stretched

by moving devices associated with the mould, and blocking of the length of net during closing of the mould is carried out by automatic pressure devices.

Brief Description of the Drawings

The invention will however be illustrated more in detail in the continuation of this description made in reference to the enclosed indicative and not restrictive drawings, in which:

Fig. 1 shows a view of an article designed to form either the seat or backrest of a chair;

Fig. 2 shows a partial schematic view of a machine for injection moulding complete with equipment to perform the invention process;

Fig. 3 shows a cross section according to arrows A-A in Fig. 2 with mould open;

Fig. 4 shows a view similar to the one in Fig. 3, but with the mould in the closing phase;

Fig. 5 shows a view similar to the one in Fig. 4, but with the mould closed; and

Figs. 6 and 7 show in detail, a pressure device in the respective start and finish blocking position of the length of the net in the mould corresponding to the length encircled in Figs. 4 and 5.

Detailed Description of the Invention

Fig. 1 shows an example of an article 10 the shape and dimensions of which can differ to construct the seat or backrest of a chair. The article 10 comprises basically a net member 11 the edges of which are embedded, therefore blocked, in a frame or perimetral border 12, made of plastic,

preferably having a certain level of elasticity.

Figs 2-5 of said drawings show a part of a machine 13 for injection moulding of plastic parts equipped with a forming mould 14. This mould is made up of two mould-halves 15, 16: one fixed and the other movable along guide columns 17 towards and away from the fixed mould-half respectively for closing and opening the mould itself. The facing surfaces of the two mould-halves 15, 16 are machined to form together when closed, a cavity 18 to contain the net member 11 and to form an impression 19 corresponding to the frame or perimetral border 12 of the article to be made.

The machine 13 is also equipped, in association with the mould 14, with a support 20 designed to sustain a net material 21 from which to obtain the net member 11 linked with the construction of the article 10 required. The support 20 is preferably but not necessarily, positioned above the mould 14, and the net material is in the shape of a continuous band wrapped in a roll 21' and with a width greater than the width of the impression 19 of the frame or edge 12 delineated by the mould-halves. The roll 21' is supported by the abovementioned support 20 and turns on its axis, and the net material 21 is unwrapped at intervals downwards following a path passing between the two mould-halves 15, 16 and set by a series of stretching and drawing rollers positioned parallel to the roll axis.

In the example illustrated, these rollers comprise at least a first couple of rollers 22 and a second couple of tension rollers 23 positioned respectively above and below the fixed mould-half 15 and a third couple of drawing rollers 24 at a distance from the second couple of rollers 23. The net material 21 is

drawn between said rollers 22-24 at an appropriate speed as shown for example in Fig. 3. Its forward movement is set and controlled by the action of the drawing rollers 24, whereas the tension rollers 22 and 23 are arranged and governed to block and stretch, both longitudinally, and crossways, the length of net material 21' compacted each time between the first and second couple of rollers 22 and 23 and face the fixed mould-half 15.

Pressure devices 25, either spring or pneumatically governed, facing towards the other mould-half and designed to block the length of net material 21" against the surface of the fixed mould-half 15 as soon as the mould is closed – Figs. 6-7, are mounted on board the movable mould-half 16, external to the impression 19 corresponding to the frame or border 12 of the article to be made.

Starting from the open mould as shown in Fig. 3, the procedure of the invention is carried out as follows: a length 21' of the net material 21 is drawn in front of the fixed mould-half 15; the length of net material 21" is stretched by the tension rollers 22 and 23; the movable mould-half 16 is moved towards the fixed one to block the length of net 21" against the surface of the fixed mould-half – Fig 4 – with successive complete closure of the mould – Fig. 5

At this stage plastic is injected into the impression 19 of the mould, thus forming the frame or edge 12 overmoulded to a corresponding part of the net length, which becomes embedded and therefore blocked.

Consecutively, the mould is opened to extract a semi-finished article, cutting at the same time, at least crossways, the length of net material extending, in this case, above the frame or edge 12 formed in the mould.

In addition an operation to trim the superfluous parts 121 – Fig. 1 – of the length of net overlapping the frame or edge 12 will be provided. This operation can be carried out directly in the machine with the mould open, immediately prior to extraction of the semi-finished article, or off the machine, working on the semi-finished article, in either of the cases using an appropriate trimming system. The finished article will now be ready to be applied in the usual way to construct, depending on its configuration, a seat or a backrest.

"METHOD AND EQUIPMENT FOR THE FORMATION OF MANUFACTURED ARTICLES INCORPORATING A NET MEMBER"

CLAIMS

1. A process for the formation of articles, in particular seats and/or backrests of chairs, incorporating a net member with a plastic frame and perimetrical edge, including the steps to:

- prepare a injection moulding machine for plastic provided with a mould made up of two mould –halves movable one with regards to the other to open and close the mould and defining, when closed, an impression corresponding to the frame or perimetrical edge of the article;

- place and position in front of a mould-half, with the mould open, a length of initial net material held and stretched orthogonally, said length of the net material having width and length dimensions sufficient to extend and overlap the external edges of the impression in said mould;

- close the mould, blocking contextually the length of net material against said mould-half;

- inject plastic into the impression formed by said closed mould, to make a frame or perimetrical edge overmoulded and incorporating a corresponding part of the length of net material;

- open the mould to extract a semi-finished article by first trimming crossways a length of net material overlapping the frame or edge of the article.

2. Process according to claim 1, characterised by the removal by trimming the superfluous parts of the length of net material around the overmoulded frame or edge to finish the article.

3. Process according to claims 1 and 2, characterised in that trimming of the superfluous parts of the length of the net material around the overmoulded frame or edge is carried out on the injection moulding machine after opening the mould.

4. Process according to claims 1 and 2, characterised in that trimming of the superfluous parts of the length of net material around the overmoulded frame or edge is carried out off the injection moulding machine in an additional operation on the semi-finished article.

5. Process according to any of the previous claims, characterised in that the length of net material positioned between the mould-halves is part of a net material in the form of a continuous belt wound in a roll and intermittently unrolled, this roll turning on the injection moulding machine in association with the mould.

6. Process according to any of the previous claims, characterised in that the length of net material placed between the mould-halves and held and stretched orthogonally by movable devices associated with at least two sides of the mould, and in that the blocking of the length of net material on closing the mould is carried out by automatic pressure devices.

7. An equipment for a injection moulding machine for moulding plastic articles, such as chair seats and/or backrests, incorporating a net member in a plastic frame or perimetrical edge, according to the process in

the previous claims, comprising a mould made up of two mould-halves movable one with the other to open and close the mould and forming, when closed, an impression corresponding to the frame or border of the article; devices associated with said mould to position a length of the initial net material between the mould-halves when they are open, where the width and length dimensions of said length of net material are greater than those of said impression in said mould so as to overlap the external edge of the impression; devices to stretch and hold said length of initial net material between the closed mould-halves and to release said length of net on re-opening the mould; and devices for cutting, after moulding the frame or perimetrical edge, the length of the initial net in at least one direction external to said frame or edge on opening the mould.

8. Equipment according to claim 7, in which the length of initial net material is part of a net material wrapped in a roll, and in which the devices for positioning the length of initial net material between the open mould-halves include rollers for directing said length of net between said mould-halves starting from said roll.

9. Equipment according to claim 7, in which the devices for stretching and holding said length of initial net material between the open mould-halves include at least a first and a second couple of tension rollers from opposite sides of the mould, and at least one couple of drawing rollers, the net material being conducted between said couples of rollers, and tension rollers being configured and run to stretch and block the length of initial net material in two orthogonal directions.

10. Equipment according to claim 7, in which devices to block said length of initial net material between the closed mould-halves include automatic pressure or pneumatic thrusting devices assembled in a mould-half and facing towards the other mould-half.

11. Equipment according to any of the claims 7-10, including in addition, cutting devices associated with the mould to trim the superfluous parts of the length of initial net material around the frame or perimetrical edge of the article.

12. An injection moulding machine for moulding plastic articles, characterised by an equipment according to claims 7 – 11 and run to perform a procedure for making articles, such as seats and/or backrests, incorporating a net member with a plastic frame and perimetral edge, according to the process in the claims from 1 to 6.

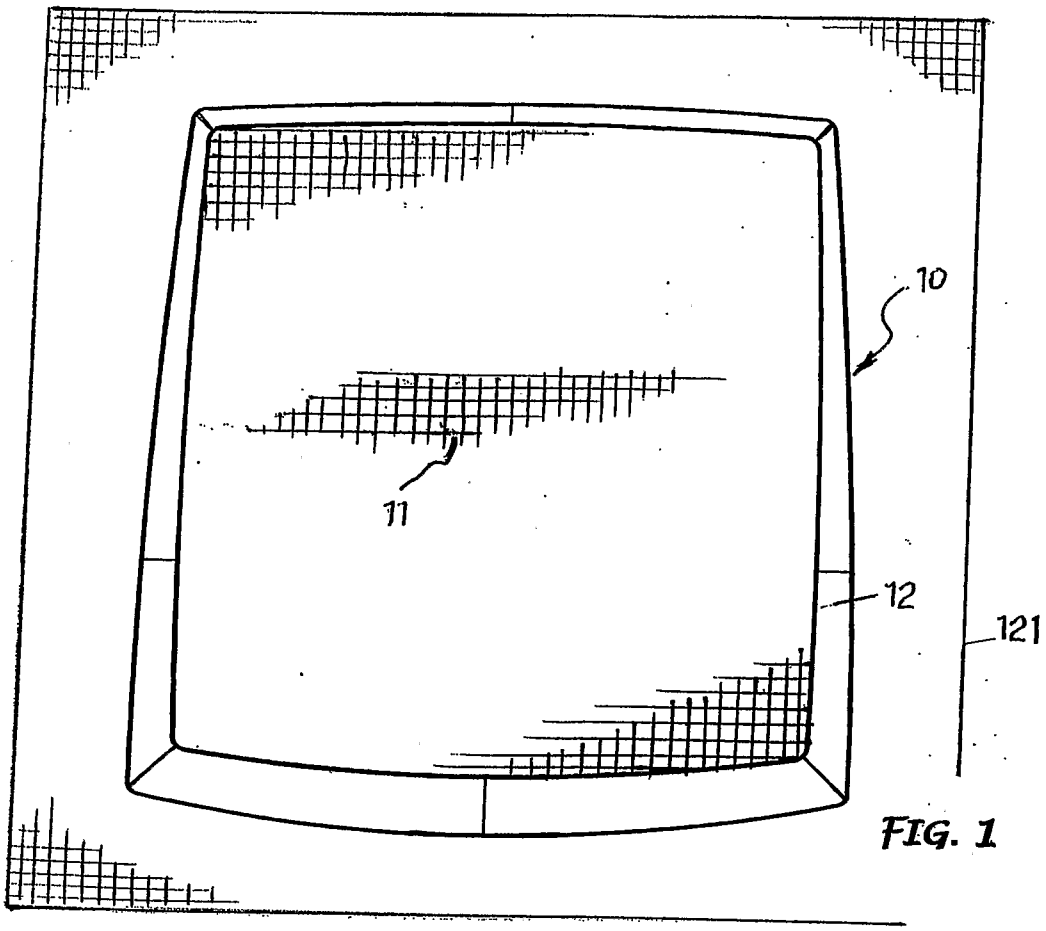

FIG. 1

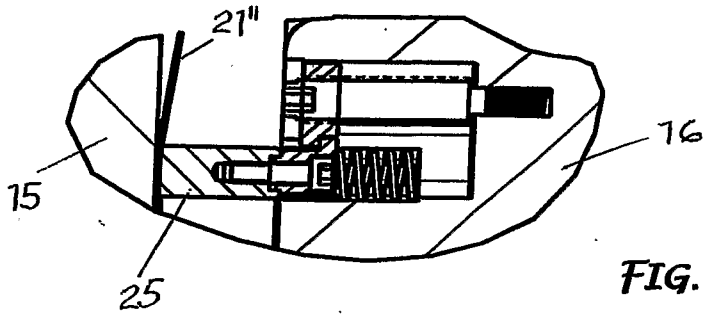

FIG. 6

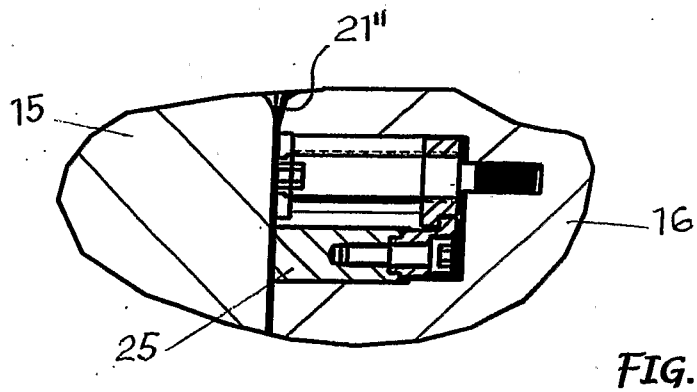

FIG. 7

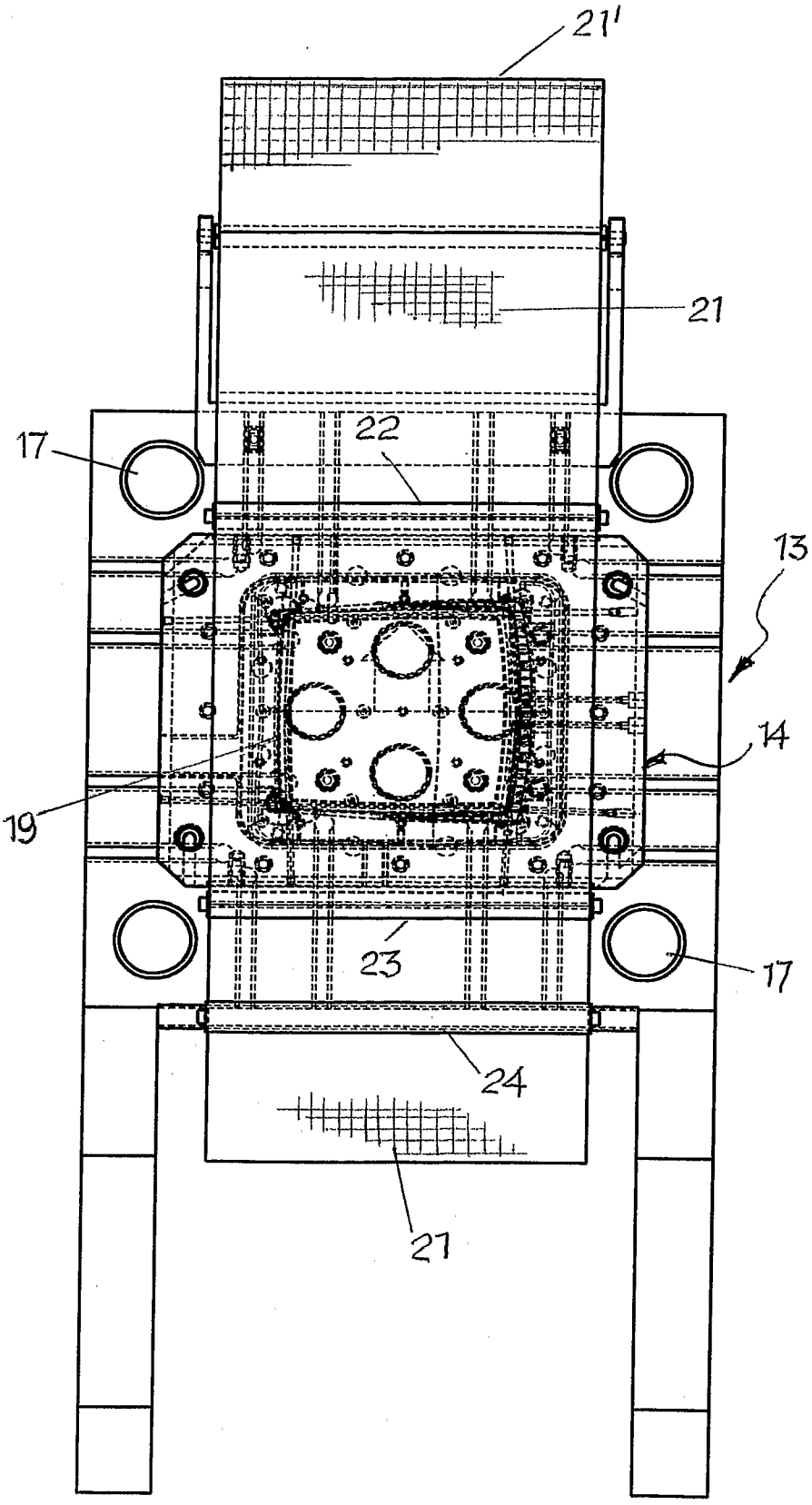

FIG. 2

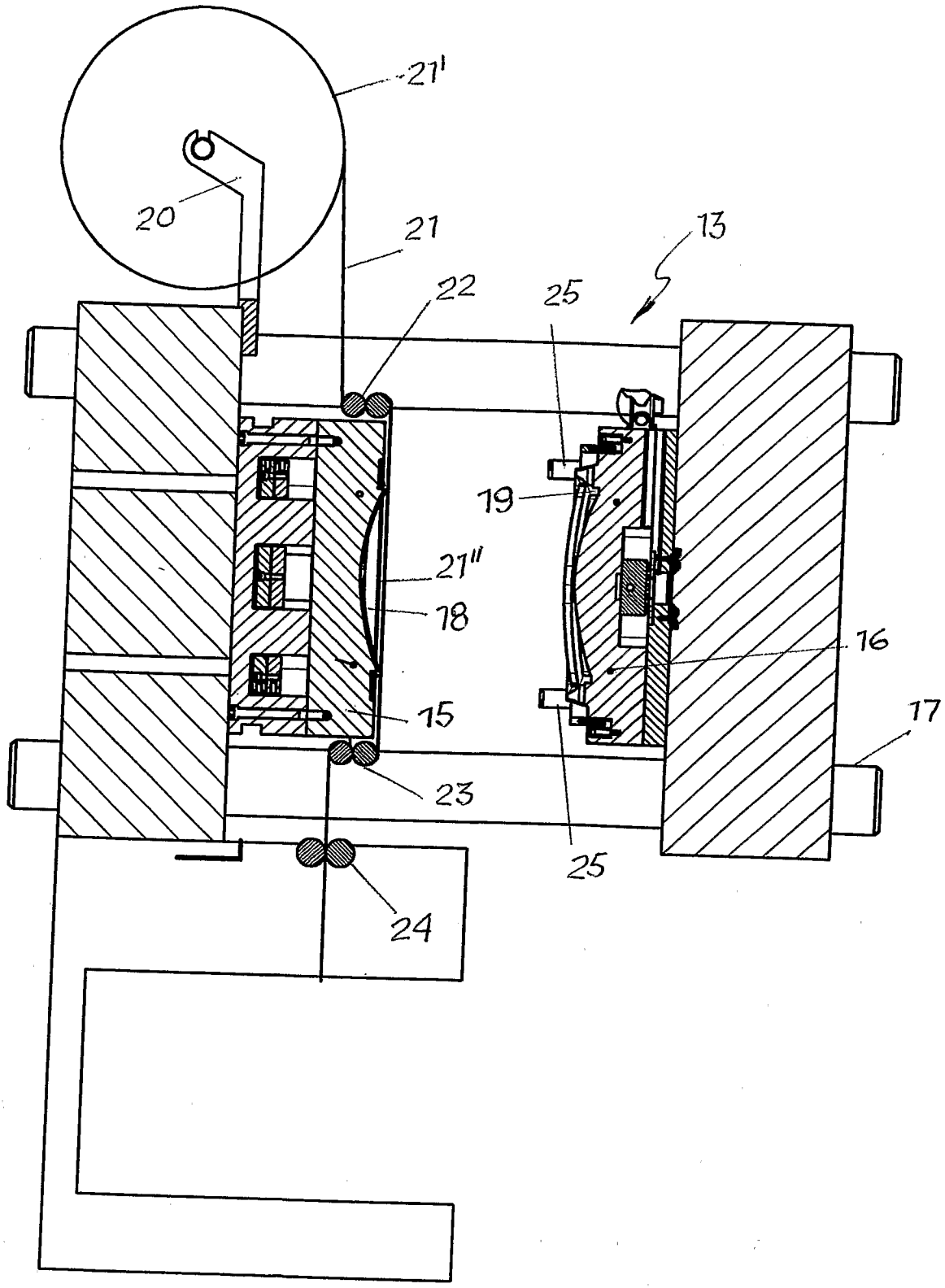

FIG. 3

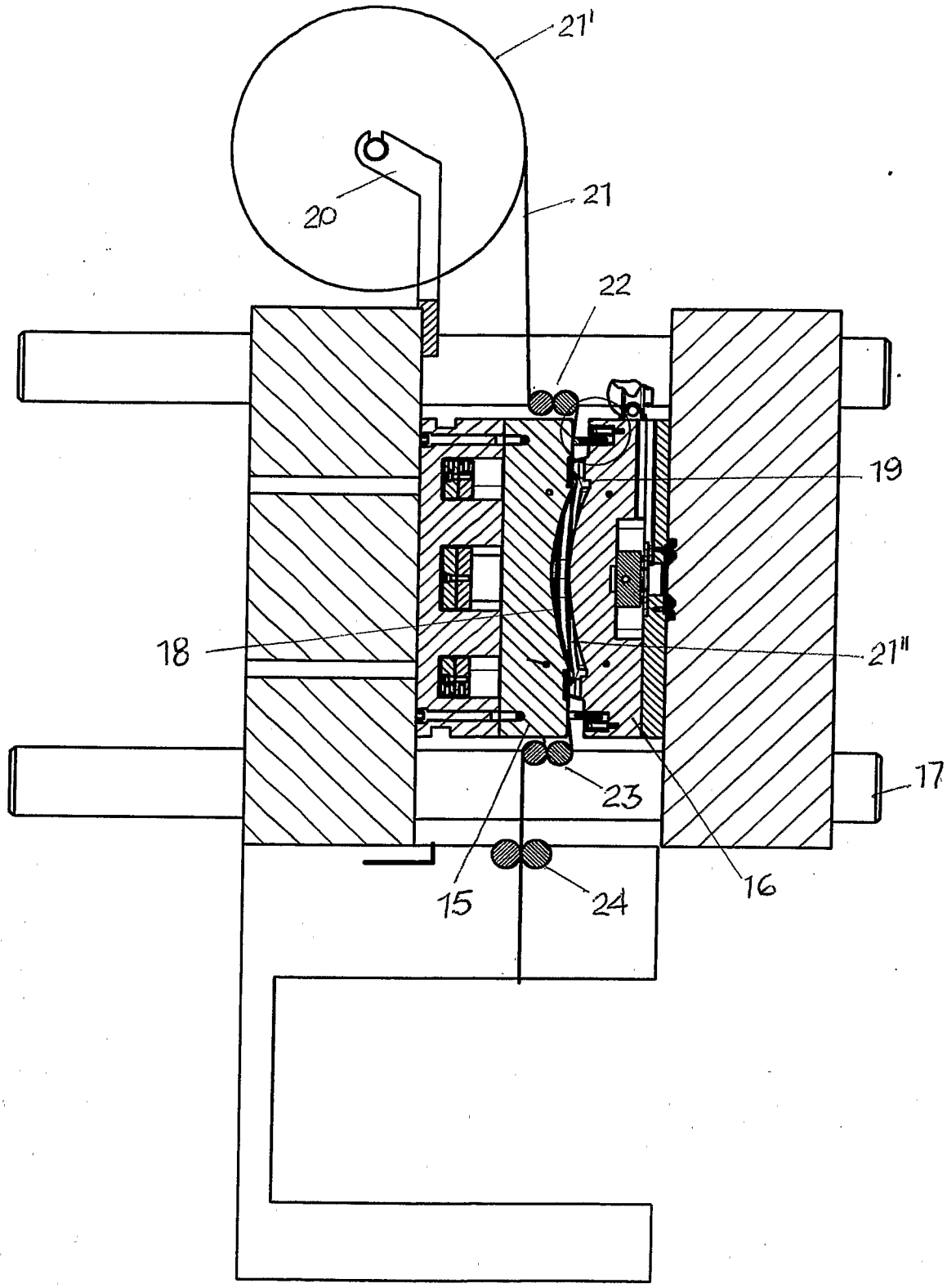

FIG. 4

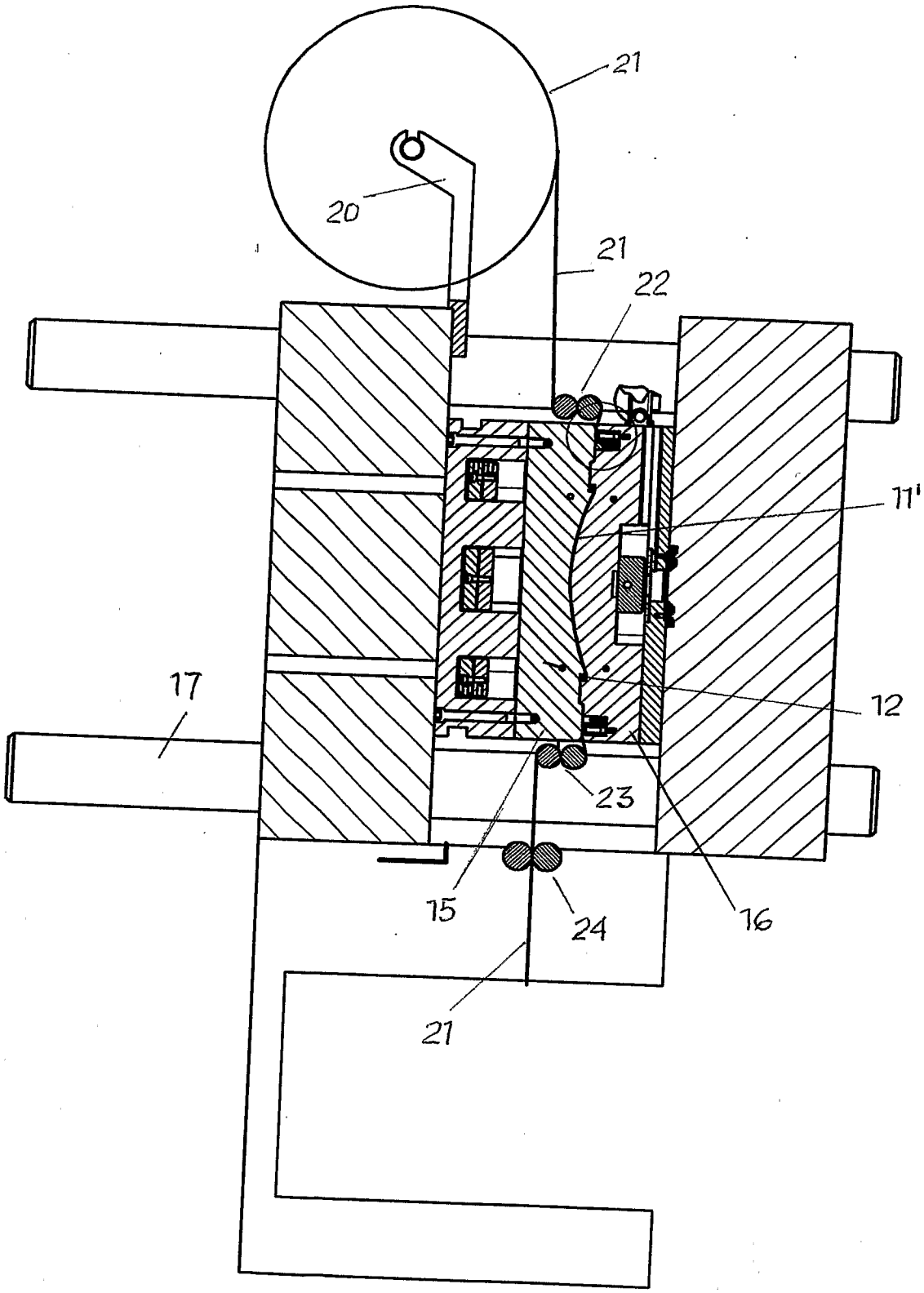

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2007/000056

A. CLASSIFICATION OF SUBJECT MATTER
INV. B29C45/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
5 June 2007	18/06/2007

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Alink, Maarten

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2007/000056

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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