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(12) # EUROPEAN PATENT APPLICATION

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(54) **Condensation device, particularly for washing-drying machines.**

(57) In a washing-drying machine, a condensation device comprises a condensation duct (10) wherein the warm and humid air, arriving from the tank (2) which contains the laundry to be dried, is struck by a jet of cooling water. The duct comprises a plurality of grids, arranged in a cascade, to facilitate the forming of films of water and thus effectively trap the lint and allow an easy cleaning of the duct.

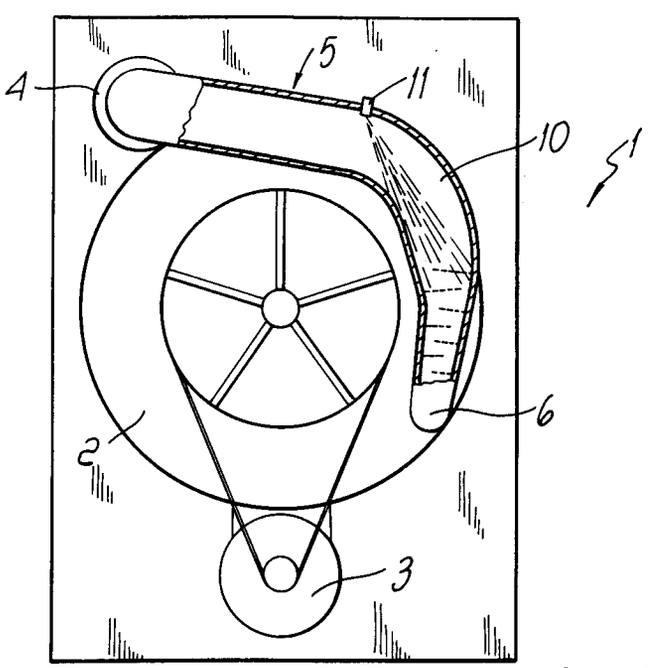

Fig.2

EP 0 485 700 A1

The present invention relates to a condensation device, particularly for washing-drying machines.

Laundry washing-drying machines with closed-cycle air circulation are washing machines provided with an air circulation device which starts to operate at the end of the washing cycle and of spin-drying and dries the laundry completely.

A device is known wherein the air enters the tank in which the laundry is heated by a radiating element, removes the moisture, passes through the holes of the drum along the discharge ducts, and rises to the fan which pushes the air back into the tank.

The air, passing through the warm laundry, evaporates the moisture and passes into the discharge duct, where, in contact with the cooling water, it deposits the humidity.

Repetition of this cycle for approximately 100-150 minutes allows perfect drying of the laundry.

In another type of known device, the air is pushed by a fan into a resistor, where it is heated and fed into the tank which contains the wet laundry. The air becomes moist, is recovered, recycled and, by passing in a condenser which is kept moist and cold by a water jet, releases the moisture.

Other laundry drying systems, substantially similar to the described ones, are known wherein, air and heat are supplied to the laundry, which yields moisture to the air, the air is cooled and yields the moisture, and the air is heated again, repeating the cycle until drying is complete.

The essential component of these systems is the condenser, in which the air, in contact with the cold water, releases the moisture.

Said condenser is normally constituted by a substantially vertical duct, in which the stream of warm and moist air, arriving from below, is struck by a film of water, arriving from above, which causes its cooling and the consequent condensation of the moisture.

The water furthermore captures and removes the laundry lint, which is suspended in the drying air and is subsequently disposed together with the waste water.

The condensation water jet furthermore washes the walls of the duct which, during operation, tend to become covered with lint.

In practice, in known condensers, in order to contain water consumption, the condensation cooling jet is sensibly limited and the film of water which it produces is always very unsteady and is actually reduced to a dripping from above.

This entails first of all a poor heat exchange between the rising air and the descending water, and also a very limited washing of the duct.

The Italian patent no. 1217490 and European patent application No. 8910331.4, in the name of this same Applicant, disclose a condenser of the above described type which overcame the disadvantage of the poor washing of the duct by causing the tank filling water to pass through the condenser itself, periodically and effectively performing said cleaning action.

The aim of the present invention is to provide a condenser which can significantly improve heat exchange with respect to known condensers.

Within the scope of this aim, an object of the invention is to provide a condenser which combines with the preceding characteristic that of further reducing water consumption.

Another object of the invention is to provide a condenser wherein the duct can be cleaned easily.

This aim, these objects and others which will become apparent hereinafter are achieved by a condensation device particularly for washing-drying machines, comprising a condensation duct which has a first end and a second end which are connected to a washing and drying tank, which contains the laundry to be dried; a cooling water jet arranged between said ends and directed toward said first end, warm and moist air arriving from said tank being fed into said first end of said duct and escaping from said second end, said jet and said first end defining a condensation section in said duct, characterized in that said condensation section comprises a plurality of mesh members which are arranged substantially transversely inside said duct.

Further characteristics and advantages will become apparent from the description of a preferred but not exclusive embodiment of the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Fig. 1 is a schematic side view of a washing-drying machine;

Fig. 2 is a partially sectional schematic rear view of a washing-drying machine according to the invention;

Fig. 3 is a sectional rear detail view of the condensation duct;

Fig. 4 is a sectional side view, taken along the line IV-IV of Fig. 3;

Fig. 5 is a sectional view, taken along the line V-V of Fig. 4;

Fig. 6 is again a sectional view, taken along the line V-V of Fig. 4, of a mesh member according to another aspect of the invention.

With reference to the above figures, a washing-drying machine, generally indicated by the reference numeral 1, substantially comprises a tank 2, driven by a motor 3, and an air circulation system, constituted by an aspirator 4 and by a duct 5 which has a first end 6 and a second end 7 which are both connected to the tank 2.

The duct 5 comprises: a delivery section 8, comprised between the aspirator 4 and the second end 7 and provided with a heating element 9, and a condensation section 10 comprised between the first end 6 and a nozzle 11 arranged ahead of the aspirator 4.

The condensation section 10 is preferably substantially vertical, as more clearly illustrated in Figure 2, and comprises a plurality of mesh members 12, preferably arranged transversely in the duct and in a cascade arrangement, so that the water, arriving from above, forms a succession of films on the various mesh members.

Fig. 5 illustrates in detail a mesh member 12 which is constituted by an actual mesh or grid, whereas fig. 6 is a view of an element 13 somewhat shaped like a louvered shutter, i.e. constituted by a series of parallel blades.

The operation of the device is as follows.

The aspirator 4 draws warm and humid air, arriving from the tank 2 which contains the laundry to be dried, through the first end 6 of the duct 5. The nozzle 11 simultaneously generates a small jet of water 13 which turns into a series of waterfalls 14 on the mesh members 12. This causes the forming of films of water on the mesh members 12 which are traversed by the warm and humid air arriving from the tank. This succession of water films facilitates heat exchange and the trapping of the lint present in the air. The permeability of the mesh members causes the continuous separation of the fluff from said elements, which thus remain always clean, optionally with the aid of a device similar to the one described in the above mentioned Italian patent No. 1217490, and European patent application No. 8910333.4.

The air, cooled and depleted of moisture, then passes through the heating element 9, where it is heated again and sent to the tank through the second end 7.

This cycle is repeated until the required degree of drying is reached.

In practice it has been observed that the invention achieves the intended aim and objects by providing a device which can ensure the total cleaning of the condensation duct and at the same time an efficient heat exchange.

The device according to the invention has such an efficiency in air-water exchange that the water consumptions can be reduced to one third of normal ones.

Another advantage of the invention consists of the absence of maintenance of the mesh members which, since they are self-cleaning due to the fact that the lint is eliminated with the waste water, do not need to be cleaned periodically as occurs in conventional filters.

The device according to the invention is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; all the details may furthermore be replaced with technically equivalent elements.

The materials employed, as well as the dimensions, may naturally be any according to the requirements and the state of the art.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Condensation device particularly for washing-drying machines, comprising: a condensation duct (5) which has a first end (6) and a second end (7) which are both connected to a washing and drying tank (2), which contains the laundry to be dried; a cooling water jet (13) arranged between said ends and directed toward said first end, warm and moist air arriving from said tank being fed into said first end of said duct and escaping from said second end, said jet and said first end defining a condensation section (10) in said duct, characterized in that said condensation section comprises a plurality of mesh members (12) which are arranged substantially transversely inside said duct.

2. Device according to claim 1, characterized in that said mesh members (12) partially occupy the transverse cross-section of said duct.

3. Device according to claim 1 or 2, characterized in that said mesh members (12) are arranged offset with respect to one another.

4. Device according to one or more of the preceding claims, characterized in that at least said condensation section (10) of said duct (5) is substantially vertical, said jet (13) being arranged at the upper end of said section (10) and said first end (6) being arranged at the lower end of said section.

5. Device according to one or more of the preceding claims, characterized in that it comprises a second cleaning jet which has a flow-rate substantially higher than said cooling jet and is suitable for washing at least said condensation section of said duct.

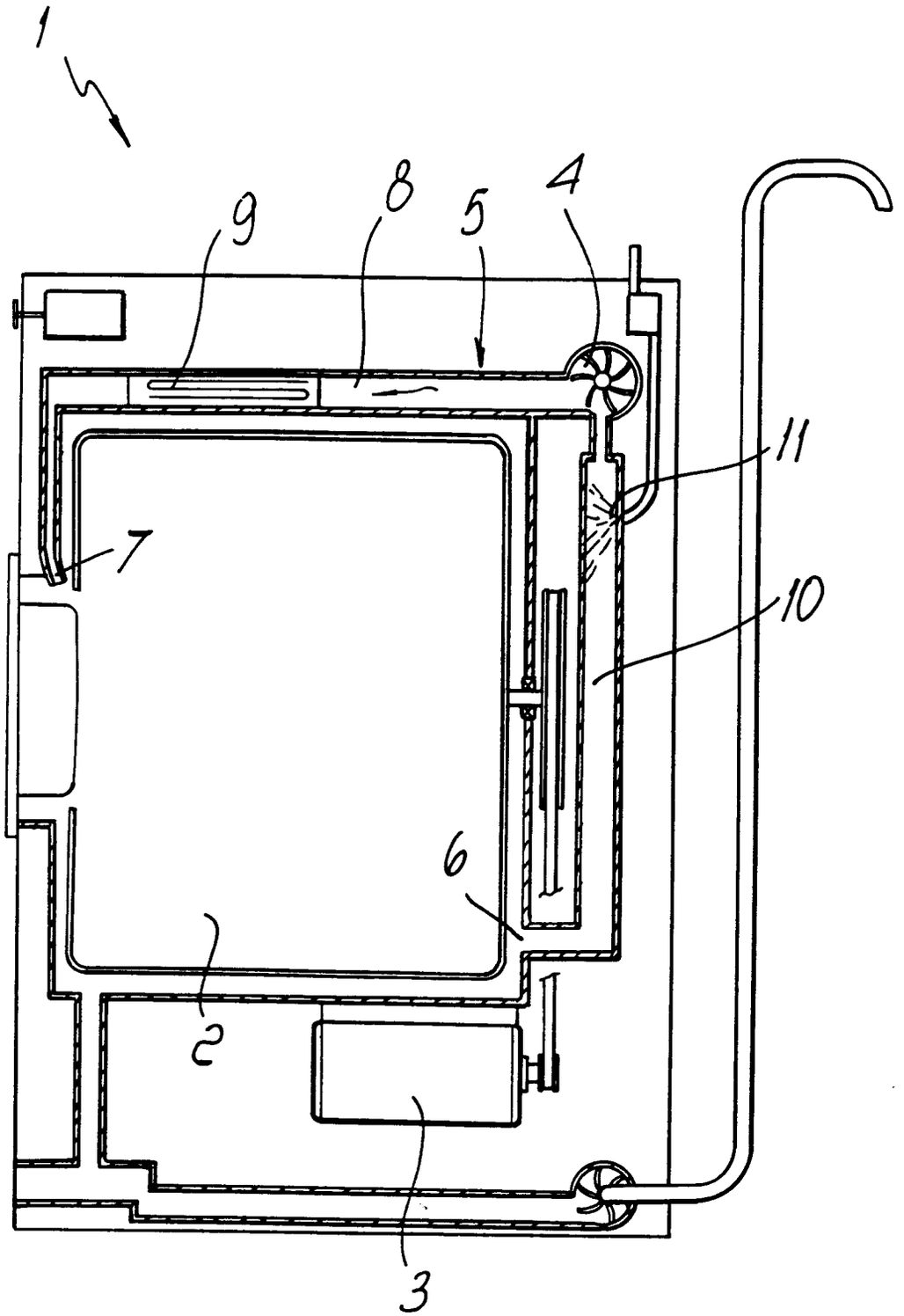

Fig. 1

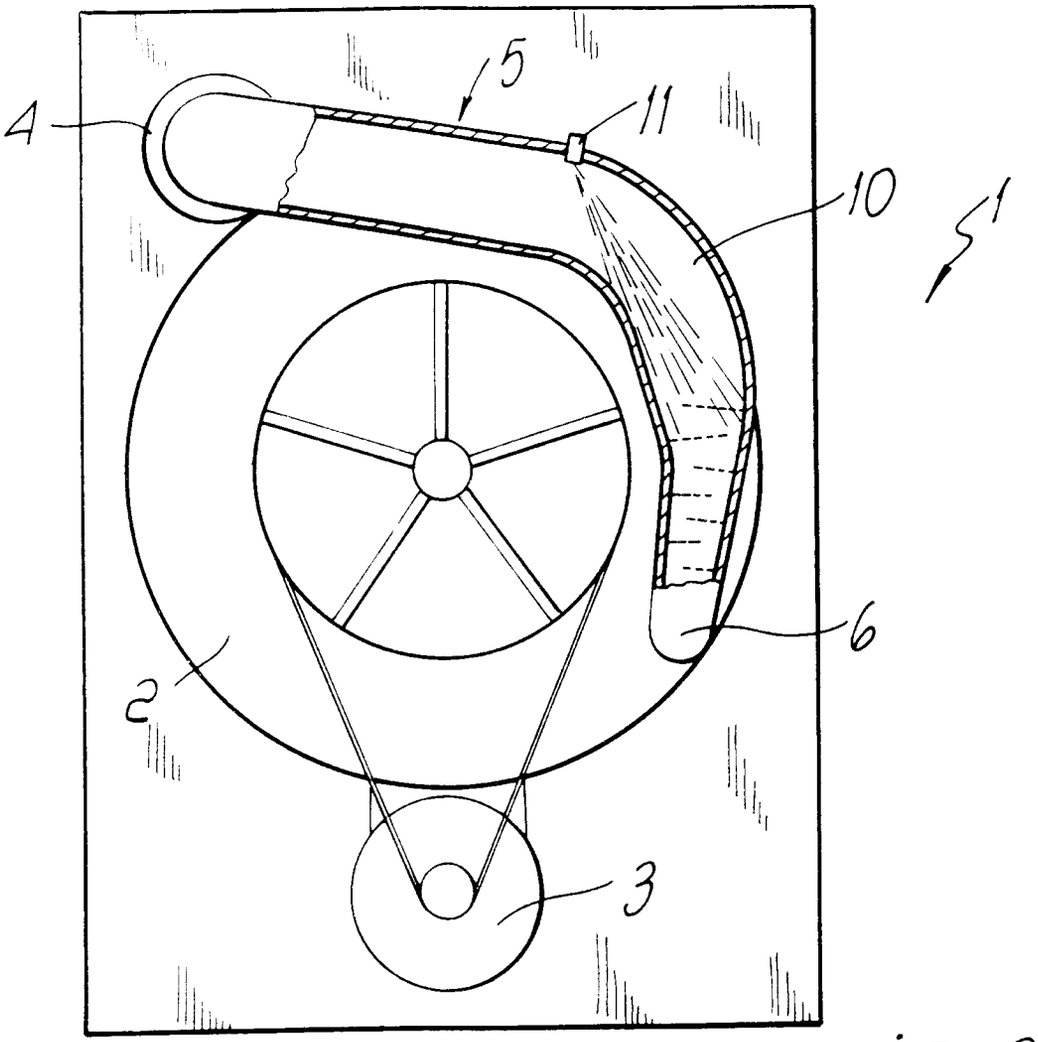

Fig. 2

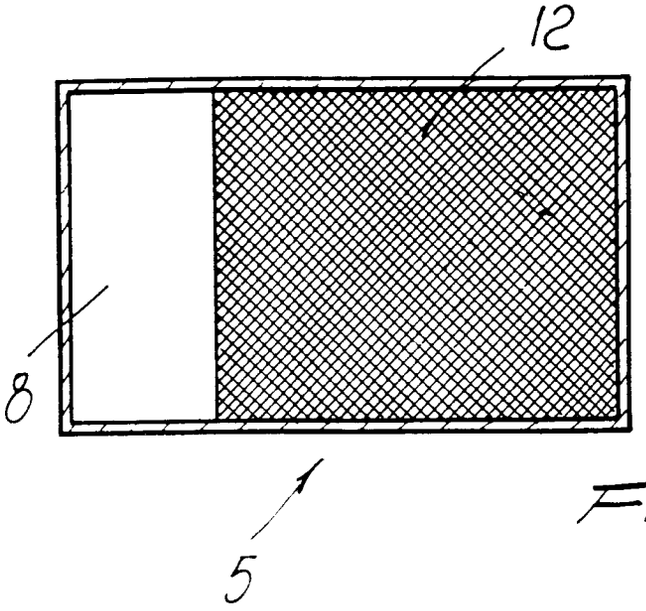

Fig. 5

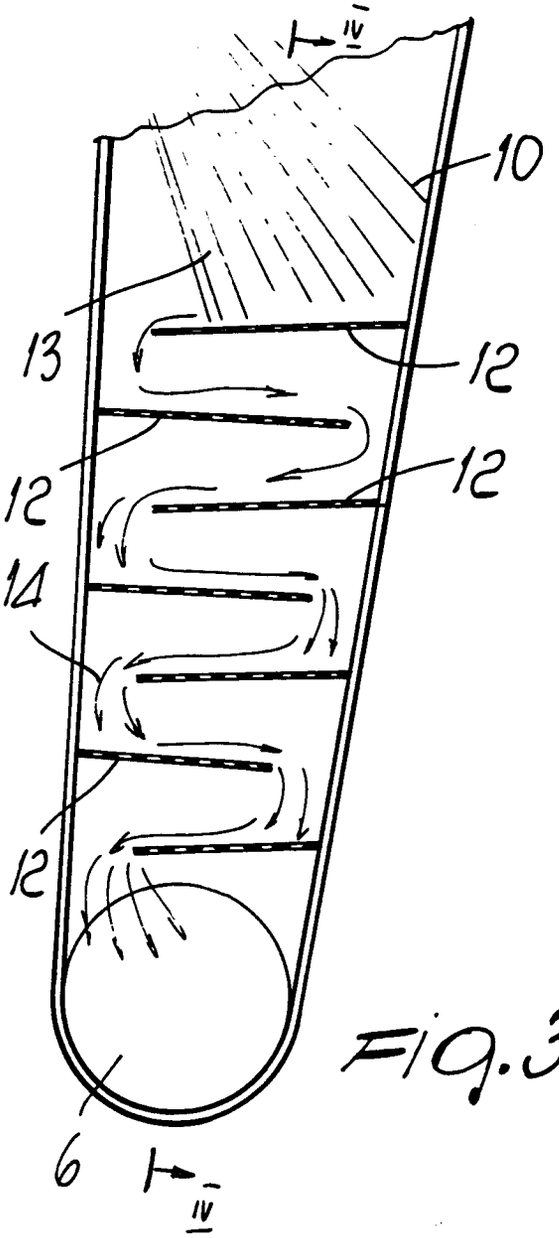

FIG.3

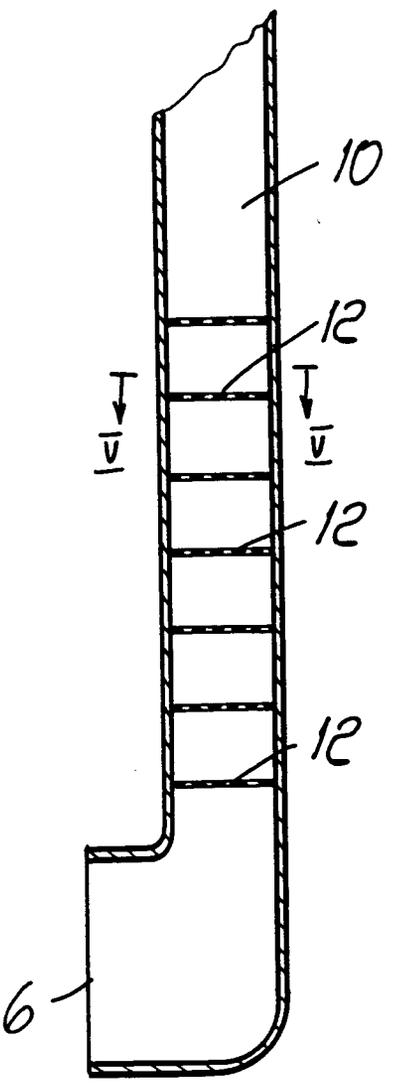

FIG.4

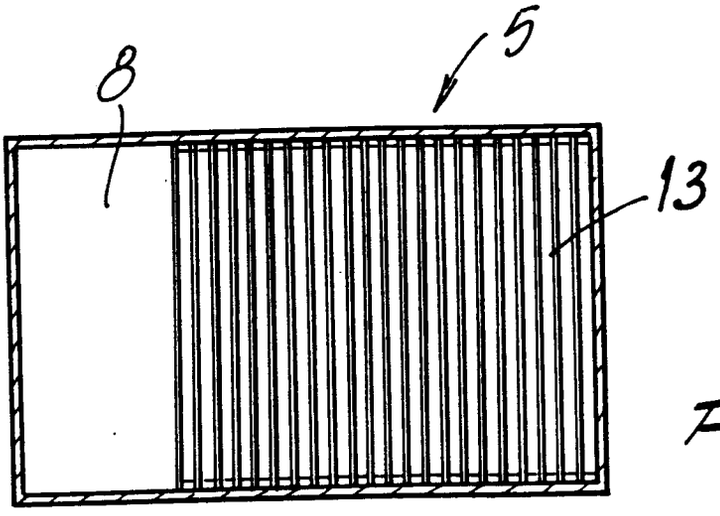

FIG.6

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EUROPEAN SEARCH REPORT

Application Number

EP 91 11 4501

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.5)
X	FR-A-2 132 077 (BEGES AG.) * claims; figure *	1	D06F58/24
X	NL-A-8 006 150 (EM. D ' HOOGE N.V.) * page 3, line 7 - line 12; figure 1 *	1	
A	WO-A-8 202 761 (R. SMITH) * page 11, line 30 - page 12, line 4; figure 1 * * page 24, line 10 - line 20 *	1	
A	FR-A-2 646 501 (ESSWEIN SA.) * claims; figures *	1-4	
A,D	EP-A-0 340 403 (A. MERLONI S.P.A.) * claims; figure *	1,5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08 JANUARY 1992	COURRIER G.L.A.

CATEGORY OF CITED DOCUMENTS

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