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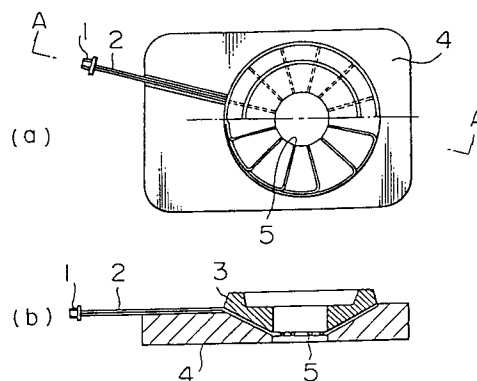
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GAZ BLOWING PLATE BRICK OR NOZZLE BRICK FOR MOLTEN METAL.

This invention relates to a gas blowing plate brick or nozzle brick for a molten metal ejector, characterized in that the plate brick or nozzle brick is divided into at least two segments in the horizontal direction with a plurality of small-diameter pipes arranged fixedly in a sealed state in the dividing surfaces. Each brick is capable of preventing the leakage of a gas blown into the above-mentioned kind of apparatus, and carrying out a stable casting operation, and renders it unnecessary to carry out troublesome, expensive additional steps, such as a brick cutting step, a brick boring step and a brick connecting step.

Fig. 1



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TECHNICAL FIELD

This invention relates to an inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus (or discharge regulator) of molten metal.

BACKGROUND TECHNIQUE

In a continuous casting installation, the molten metal received at a ladle is poured into a mold through a tundish. At such a time, a certain amount of molten metal is kept stored within the tundish before starting the pouring of the molten metal into the mold at the beginning of casting, and after the flowing-up of impurities a nozzle is opened to start a pouring. This procedure is called a closed start, and these days this technique has begun to be introduced.

In the closed starting of a continuous casting tundish various systems have been proposed for injecting an inert gas to prevent the molten metal from solidification within the nozzle while storing the molten metal in the tundish by closing the nozzle hole of a sliding gate valve. For example, there are known a sliding gate valve apparatus of molten metal (Patent Kokai No. 20659/86) in which a plurality of gas feeding holes communicating with the melt passing hole of the bottom plate brick of the sliding gate valve apparatus are provided and said gas feeding part are made of porous refractory, and a system (shown in Fig. 9 - Patent Kokai No. 177952/85) in which a gas injecting ring is arranged, said ring having a plurality of small radial orifices provided toward the slide plate side from a groove formed along the outer periphery within the opening of a bottom plate brick to the center of the opening.

Said known systems have the following drawbacks:

(a) The gas guiding pipe (made of copper or steel) is connected and sealed with the gas feeding holes (made of brick bored with fine orifices) by means of sealing material, mortar or soldering, and in the high temperature condition the gas sometimes leaks (shown with x marks in Fig. 9) from the joints so as not to be injected into the nozzle opening.

Further, practically the gas amount injected into the nozzle opening becomes irregular so that stable casting is often not operated whereby the products and quality are not uniform.

(b) The making process requires additional working such as a cutting processing of brick, a boring processing of brick, and a jointing working of the gas guiding pipe and the gas injecting brick thereby to demand high cost.

DISCLOSURE OF THE INVENTION

The inventors of this invention have made extensive studies and researches to solve the various problems innate in the known systems, and as the result, they have been successful in developing a novel inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal, which brick is of quite different idea from the known systems.

The present invention is technically constituted such that a plate brick or nozzle brick for use in an apparatus of discharging molten metal is split into at least two parts horizontally, and said split surfaces are provided with a number of small diameter pipes (2) in the sealed state, and said pipes are secured to said split surface. By means of such technical constitution it is possible to achieve the undermentioned function and effect.

(a) The gas passing route where gas is likely to leak and where the temperature is likely to rise in the vicinity of the nozzle opening, is made in one body without joints so that the gas does not leak out, and therefore, the whole gas as fed is injected into the nozzle opening.

(b) After the formation of the plate brick or nozzle brick by pressing, the additional working such as cutting processing or boring processing is no longer required, so that cost decreases.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows one embodiment of the invention, in which the gas guiding pipes are incorporated in the normal direction of and obliquely downward to the nozzle opening of the plate brick;

Fig. 1a is a partly notched plan view;

Fig. 1b is a vertical sectional view taken along the A-A line of Fig. 1a;

Fig. 2a and Fig. 2b are also a plan view and a vertical sectional view, similar to Fig. 1, which show a different embodiment of the invention, in which the gas guiding pipes are incorporated in the normal direction of and obliquely downward to the nozzle opening of the plate brick;

Fig. 3a and Fig. 3b show an embodiment of the gas guiding pipes (in the case of plurality) which are incorporated in the brick, and Fig. 3b is a sectional view taken along the A-A line of Fig. 3a;

Fig. 4a and 4b show an embodiment in which the gas guiding pipes are incorporated in an insert nozzle brick, and Fig. 4a is a vertical sectional view while Fig. 4b is a lateral sectional view taken along the A-A line of Fig. 4a;

Fig. 5 is a vertical sectional view which shows an embodiment where a gas guiding pipe is applied to an immersion nozzle;

Fig. 6 is a partly sectional side view showing the respective members in the embodiment of Fig. 1;

Fig. 7a and Fig. 7b are views, similar to Fig. 4, of an example of three-split type, where the present invention is applied to the insert nozzle brick;

Fig. 8 is a vertical sectional view of an embodiment of three-split type, where the invention is applied to the plate brick; and

Fig. 9 is a vertical sectional view of a bottom plate brick for the injection of inert gas of known system.

BEST EMBODIMENT FOR CARRYING OUT OF THE INVENTION

The invention will now be described more in detail, by way of embodiment, with reference to the accompanying drawings.

Fig. 1 shows an embodiment in which the present invention is applied to a bottom plate brick. As shown, said plate brick is split into bricks 3 and 4, a number of small diameter pipes 2 each having a connecting port 1 to the gas source are involved and arranged in the jointing surfaces of said split bricks 3 and 4, and gas injecting openings 5 of said small diameter pipes 2 in group communicate with the melt passing hole.

Fig. 2 is similar in construction to Fig. 1, and it is an embodiment in which the gas injecting direction of the small diameter pipe 2 is brought close to the normal direction of the outer periphery of the melt passing hole. Fig. 2 is similar to Fig. 1 in other constitution.

Fig. 3a is a plan view showing an assembling mode of the group of said small diameter pipes 2, and Fig. 3b shows a sectional view of the group of said small diameter pipes 2 in the bound state.

Fig. 4 is an embodiment in which the present invention is applied to an insert nozzle brick. In this embodiment, the insert nozzle brick is split into bricks 3 and 4, a group of the small diameter pipes 2 are involved and arranged, similarly to the above, in the split surfaces, and gas injecting openings 5 communicate with the melt passing hole.

Fig. 5 shows an embodiment in which the invention is applied to an immersion nozzle 8. In this embodiment, a through hole is provided in the nozzle body and the small diameter pipes 2 in group are arranged in said holes.

Fig. 6 is a sectional view where respective parts in the embodiment of Fig. 1 are separately shown thereby to exemplify their arranging relationship.

Fig. 7 shows an embodiment in which the insert nozzle brick is split into three parts (3, 3' and 4), and the gas injecting openings 5 are disposed

in two rows of upward and horizontal directions in the melt passing hole.

Fig. 8 shows an embodiment in which similarly, the insert nozzle brick is split into three parts (3, 3' and 4), and the injecting openings 5 are disposed also in two rows up and down.

FUNCTIONS

A plate brick or a nozzle brick which is used in a sliding gate valve apparatus of molten metal is split into two or more parts, several slender stainless or copper pipes are arranged in the split surfaces toward the nozzle opening, and thereafter the split plate bricks or nozzle bricks are adhered with mortar or the like.

1) One of the two split bricks is press formed by providing grooves 10 for embedding the pipes. The brick material is the high alumina or alumina carbonaceous one which is generally used as plate brick or nozzle brick. Additionally, in the case of pipes the outside diameter of which is more thin than the mortar joint, it is unnecessary particularly to provide grooves for embedding the pipes.

2) The other of the two split bricks is not provided with the grooves for embedding the pipes, and it consists of a press formed article or a casting material. The material is the same as in 1) above.

3) For making a gas guiding pipe, a copper or stainless pipe of about 0.2 - 3.00 mm inside diameter is bend worked in advance to meet the shape of the groove of the brick. In the case of a plurality of pipes, they are assembled in a single pipe by soldering or the like and a nipple for connection is secured to the tip of said assembled pipe.

4) In the case of a plurality of pipes, the inside diameter, length and securing position of each of the pipes are varied in consideration of the pressure loss caused by the difference of the lengths of the respective pipes, so that the gas may be injected uniformly into the nozzle hole.

5) In order that the pressure loss of the pipes is decreased, the inside diameter of the pipes is made larger except the gas injecting port portions of the pipe. Further, in case the pipes are two or more, they are combined and connected to a single larger pipe whereby the pressure loss is decreased (see Fig. 3).

EFFECTS OF THE INVENTION

(1) Since the inert gas fed into the pipes passes through a jointless piping so as to be injected into the nozzle hole, the gas cannot be leaked and it is possible to feed the gas in a certain

amount.

In known techniques, for example, a cylindrical brick bored with fine orifices was set to a plate brick and a metallic pipe was connected to the gas reservoir provided therebetween. However, gas leakage could not be prevented being affected by the heat generated from the molten metal when casting.

(2) Since the plate brick itself does not form a part of the gas passing route it is unnecessary that the brick is machine worked to form a gas passage there. Because of this, the brick as press formed can be used as it is to allow the manufacturing process to be simplified. This leads to a cost lowering.

(3) By varying the size, number, position and angle of the pipes it is possible to easily manufacture bricks of the constructions suited for closed start and blocking prevention respectively.

brick is bored with at least one through hole, and said through holes are provided with small diameter pipes.

Claims

1. An inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal, characterised in that said plate brick or nozzle brick is horizontally split into at least two parts, and a number of small diameter pipes are sealingly arranged and secured in said split surfaces.
2. An inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal as described in Claim 1 wherein said small diameter pipes are bundled in a plurality of groups, and each group of the pipes is communicated with a gas passing portion.
3. An inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal as described in Claim 1 or Claim 2 wherein said small diameter pipes are disposed either in the direction between the normal and the tangent to the nozzle opening or obliquely above and down the nozzle opening or in combination of both the disposition.
4. An inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal as described in any of Claims 1 to 3 wherein said small diameter pipes are made of metal or ceramic.
5. An inert gas injecting plate brick or nozzle brick for use in a sliding gate valve apparatus of molten metal as described in any of Claims 1 to 4 wherein said plate brick or said nozzle

Fig. 1

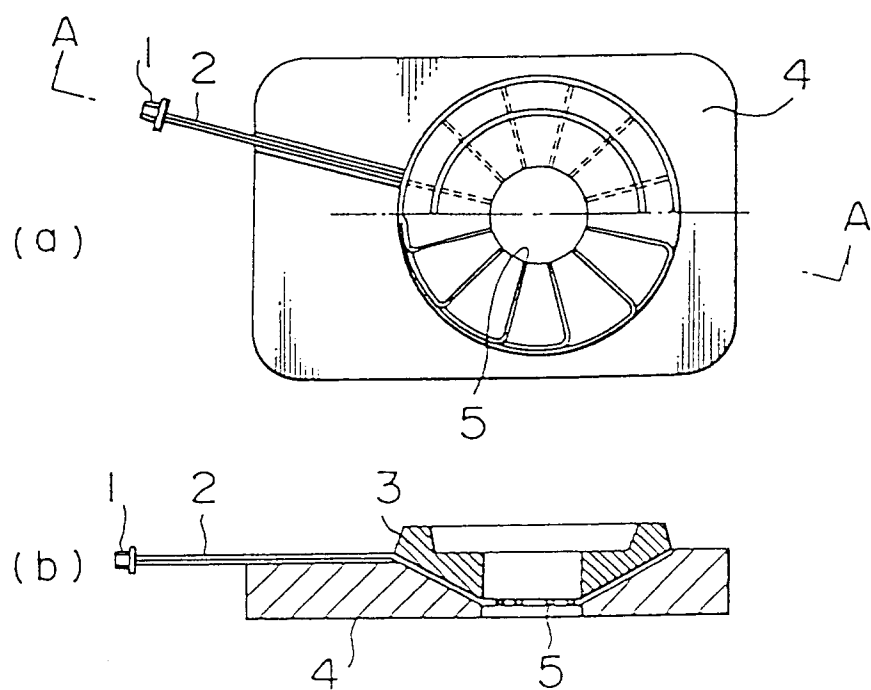


Fig. 2

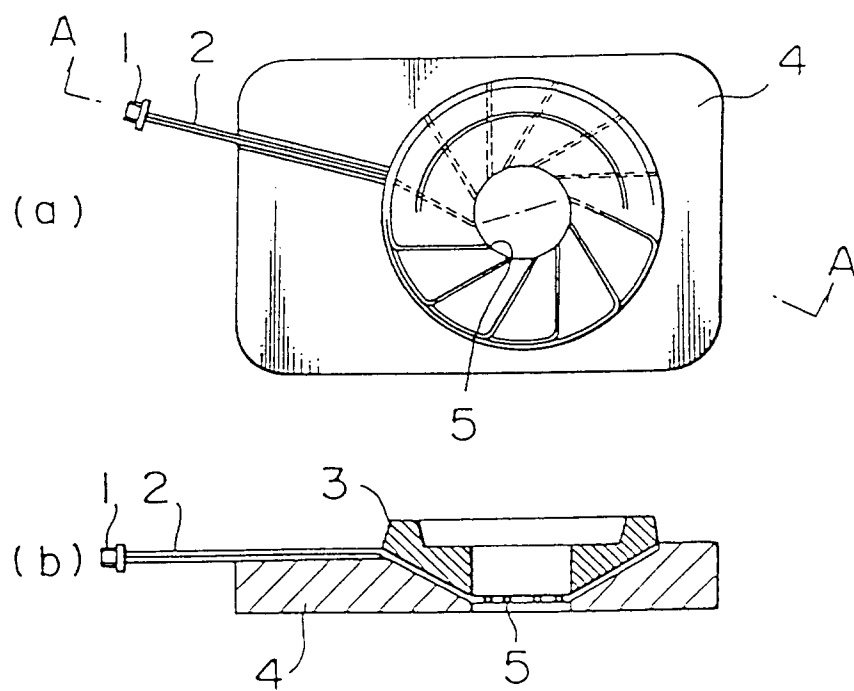


Fig. 3

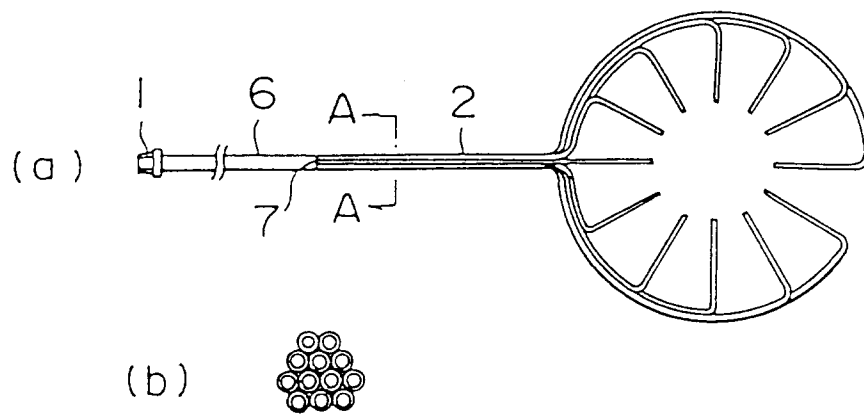


Fig. 4

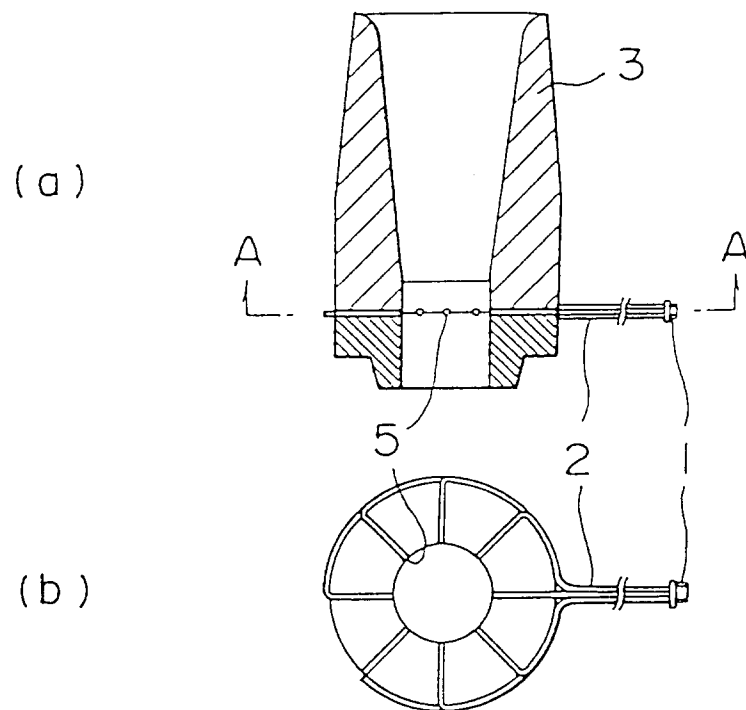


Fig. 5

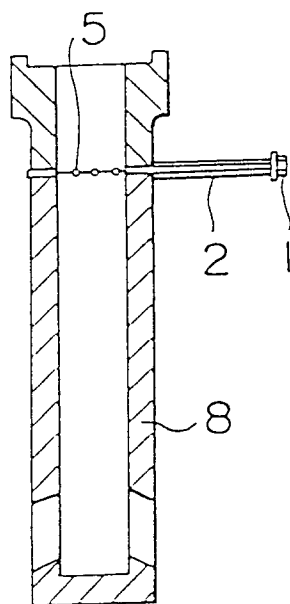


Fig. 6

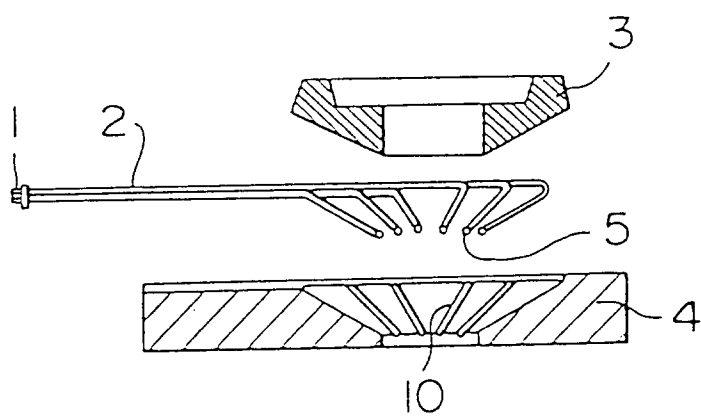


Fig. 7

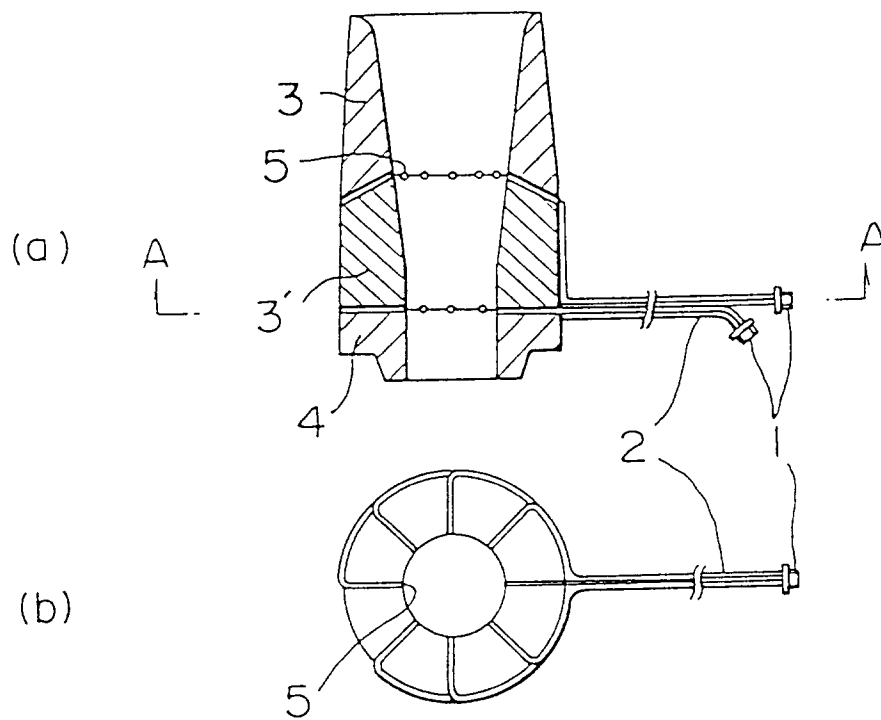


Fig. 8

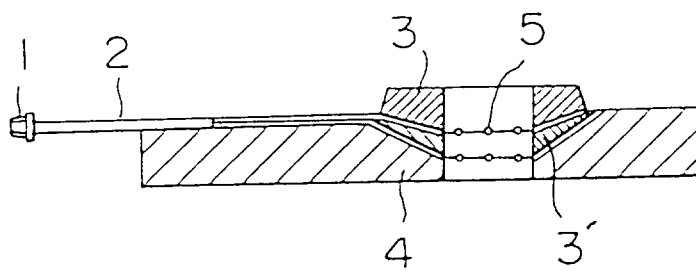
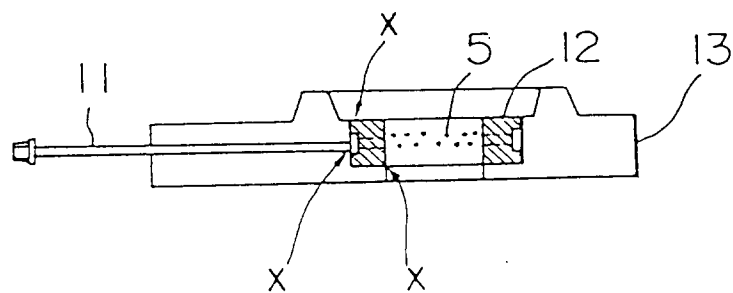


Fig. 9



INTERNATIONAL SEARCH REPORT

International Application No PCT/JP89/00551

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl ⁴ B22D37/00, 41/08, 11/10		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC	B22D37/00, 41/08, 11/10	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
Jitsuyo Shinan Koho	1926 -1989	
Kokai Jitsuyo Shinan Koho	1971 - 1989	
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category [*]	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	JP, A, 61-195734 (NKK Corporation) 30 August 1986 (30. 08. 86) Page 1, lower left column, lines 5 to 14, Fig. 2 (Family : none)	1 - 5
X	JP, A, 53-123336 (Nippon Steel Corporation) 27 October 1978 (27. 10. 78) Page 2, upper right column, lines 2 to 6, Fig. 2 (Family : none)	1 - 5
[*] Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
July 25, 1989 (25. 07. 89)	August 14, 1989 (14. 08. 89)	
International Searching Authority	Signature of Authorized Officer	
Japanese Patent Office		