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

(11) Publication number: **0 084 570**
A1

(12) # EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(21) Application number: **82900152.8**

(22) Date of filing: **28.12.81**

Data of the international application taken as a basis:
(86) International application number:
PCT/JP 81/00425
(87) International publication number:
WO 82/02216 (08.07.82 82/17)

(51) Int. Cl.³: **D 03 C 1/06**, D 03 C 1/26

(30) Priority: **29.12.80 JP 185714/80**

(43) Date of publication of application: **03.08.83**
Bulletin 83/31

(84) Designated Contracting States: **CH DE FR LI**

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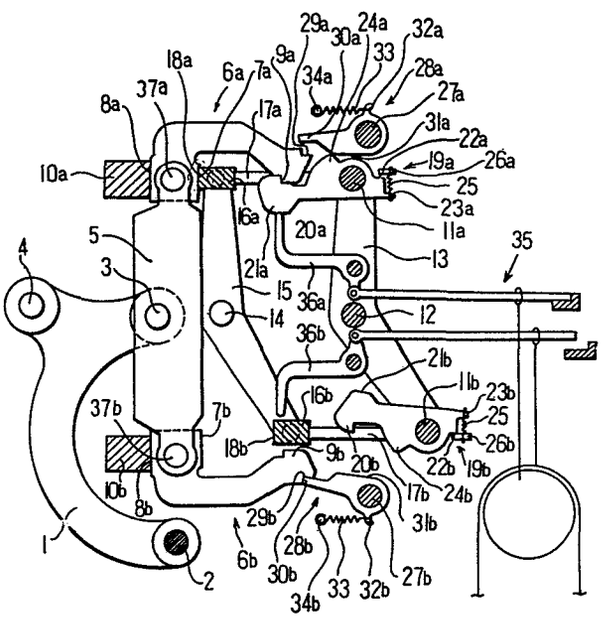
(54) **POSITIVE DOBBY MACHINE.**

(57) A positive dobby machine which has return knives (16a), (16b) formed so as to move in parallel and vertical pressure bearing planar surfaces (18a), (18b) in their direction of movement. First pressure bearing planar surfaces (7a), (7b) formed so as to be able to come into planar contact with the surfaces (18a), (18b) of the knives (16a), (16b), respectively, are formed on hooks (6a), (6b) pivotably secured to the upper and lower ends of a vertical lever (5). The vertical lever (5) is driven by urging the surfaces (7a), (7b) of the hooks (6a), (6b) in a planar contacting state with the pressure bearing surfaces (18a), (18b) of the return knives (16a), (16b), respectively.



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DESCRIPTION

POSITIVE DOBBY MACHINE

Technical Field

The present invention relates to positive dobby machines constituted to drive heald frames positively in both upward and downward directions, and more specifically to a positive dobby machine where mechanism in a vertical lever, upper and lower hooks pivotally connected respectively to upper and lower ends of the vertical lever, and upper and lower return knives acting to push back both ends of the vertical lever.

Background Art

In positive dobby machine in prior art, a command device constituted to generate command corresponding to fabric pattern acts to rotate upper and lower hooks pivotally connected respectively to upper and lower ends of a vertical lever. Therefore upper and lower return knives opposed respectively to upper and lower ends of the vertical lever are contacted with both ends of the vertical lever directly so as to transmit movement. If upper and lower return knives were constituted to push the vertical lever through upper and lower hooks, the pushing force would produce revolution resistance in the upper and lower hooks and rotation of both hooks according to the command device would be difficult.

Since the revolution center of the vertical lever and upper and lower return knives cannot coincide with each other, surface contact state of the vertical lever with the

return knife cannot be held throughout whole stroke of transmission. Therefore, partial cylindrical surfaces are usually formed on upper and lower ends of the vertical lever, and pressure receiving surfaces of upper and lower knives opposed to respective cylindrical surfaces are formed in flat planes, so that the cylindrical surface and the flat plane are contacted with each other in line contact state. In such constitution, pressure per unit area between the vertical lever and the return knife becomes very large. Moreover sliding phenomenon between contact portions because of non-coincidance of the revolution center increases abrasion of the contact portions. High-speed operation of positive dobby machines therefore has been obstructed.

Disclosure of Invention

This invention is characterized in constitution of an apparatus that upper and lower return knives are contacted in surface contact state with upper and lower hooks and push them, which hooks are pivotally attached to upper and lower ends of a vertical lever, a command device acts on upper and lower knife hooks which can be engaged with the upper and lower hooks respectively, upper and lower knife shafts which support the upper and lower knife hooks respectively are moved in parallel and integral with the upper and lower return knives,and upper and lower hook stoppers which are engaged with the upper and lower hooks respectively are moved by the upper and lower knife hooks.

An object of this invention is to provide a positive dobby machine in which movement of upper and lower return knives is transmitted to upper and lower ends of a vertical lever

through surface contact means thereby abrasion in transmission portion is reduced.

Another object of this invention is to provide a positive dobby machine which can be driven at high speed.

Above mentioned and other objects and features of this invention will be apparent from the following description referring to the accompanying drawings. However, the drawings are for explanation only and not for limiting the scope of this invention.

Brief Description of the Drawings

The drawings show preferable embodiments of this invention. Fig. 1 is a schematic sectional view of a positive dobby machine.

Best Mode for Carrying Out the Invention

A preferred embodiment of the present invention will now be described referring to Fig. 1. A stationary shaft 2 has both longitudinal ends fixed to a machine frame (not shown). A plurality of jack levers 1 are arranged in longitudinal direction on the stationary shaft 2 and rotatably supported, the number of the jack levers 1 being the same as that of heald frames (not shown). Each jack lever 1 is provided with a pin 4 to which is pivotally connected a connecting rod (not shown) in similar manner to conventional positive dobby machine. The connecting rod is connected to a shedding lever (not shown) which, in turn, is connected to heald frame (not shown) through transmission means. The jack lever 1 is provided with another pin 3 to which a vertical lever 5 is pivotally connected.

The vertical lever 5 is formed in vertical symmetry with respect to the pin 3 and has both vertical ends to which an upper hook 6a and a lower hook 6b are connected respectively through pins 37a and 37b. The upper hook 6a and the lower hook 6b are formed in vertical symmetry. First pressure receiving planes 7a, 7b and second pressure receiving planes 8a, 8b are in parallel to each other and formed at both lateral sides of the pins 37a and 37b. The upper hook 6a and lower hook 6b are provided at respective top ends with hooks 9a, 9b and notch portions 29a, 29b.

Each of upper stoppers 10a and lower stoppers 10b has both longitudinal ends connected to the machine frame. When the vertical lever 5 and second pressure receiving planes 8a, 8b of the upper and lower hooks 6a, 6b are all in the vertical direction, the upper stopper 10a contacts with the second pressure receiving plane 8a of the upper hook 6a in surface contact state and also the lower stopper 10b contacts with the second pressure receiving plane 8b of the lower hook 6b in similar manner. As clearly seen from the figure, above mentioned state occurs when the jack lever 1 is rotated most in counterclockwise direction. In this attitude, a driving shaft 12 being as high as the pin 3 has both longitudinal ends rotatably supported on the machine frame and is moved in reciprocal rotating motion by means of driving mechanism (not shown). On forward and rearward sides of the driving shaft 12 are fixed two driving levers 13 each bent in symmetric form with respect to the driving shaft 12. Two driving levers 13 respectively have both vertical ends to support an upper knife shaft 11a and a lower knife shaft 11b rotatably. A driven lever 15 has the same configuration as the driving lever 13 and is pivotally mounted on the machine frame

by a pin 14 being as high as the driving shaft 12. Two driven levers 15 are opposed respectively to two driving levers 13. Both longitudinal ends of an upper return knife 16a are pivotally connected to upper ends of two forward and rearward driven levers 15 respectively, and in similar manner both longitudinal ends of a lower return knife 16b are pivotally connected to lower ends of two driven levers 15 respectively. An upper connecting member 17a and a lower connecting member 17b are integrally connected respectively with the right side of both longitudinal ends of the upper and lower return knives 16a, 16b. The right ends of upper and lower connecting members 17a, 17b are integrally connected respectively with the upper and lower knife shafts 11a, 11b. Distance from the axial center of upper and lower knife shafts 11a, 11b to the axial center of upper and lower return knives 16a, 16b opposed thereto is equal to distance between the axial centers of the driving shaft 12 and the pin 14. Parallelogram link mechanism is therefore constituted by the driving lever 13, the driven lever 15 and the upper and lower return knives having the upper and lower connecting members 17a, 17b, so that the upper return knife 16a, the upper connecting member 17a and the upper knife 11a are integrally moved in parallel, and in similar manner the lower return knife 16b, the lower connecting member 17b and the lower knife shaft 11b are moved in parallel. Pressure receiving planes 18a, 18b in the vertical direction are formed respectively on leftside of the upper and lower return knives 16a, 16b.

When counterclockwise rotation of the driving lever 13 is stopped, the upper hook 6a is interposed between the pressure receiving plane 18 of upper return knife and the upper stopper 10a, and

the pressure receiving plane 18a of upper return knife is contacted with the first pressure receiving plane 7a of the upper hook 6a in surface contact state. In similar manner, when clockwise rotation of the driving lever 13 is stopped, the lower hook 6b is interposed between the lower return knife 16b and the lower stopper 10b, and the pressure receiving plane 18b of lower return knife is contacted with the first pressure receiving plane 7b of the lower hook 6b in surface contact state.

On the upper knife shaft 11a is pivotally mounted an upper knife hook 19a in opposition to the upper hook 6a. The upper knife hook 19a comprises an upward hook 20a engageable with the hook portion 9a of the upper hook 6a at stopping state of counterclockwise rotation of the driving lever 13, a command receiving portion 21a below the hook portion 20a, a stopper surface 22a formed at right side of the upper knife shaft 11a, a spring hook 23a below the stopper surface 22a, and a projection 24a formed at upper left-side of the upper knife shaft 11a. Other end of the spring 25 is hung to the spring hook 23a and connected with the upper stay 26a. The upper stay 26a has both longitudinal ends fixed to two upper connecting members 17a respectively. The upper knife hook 19a is urged counterclockwise.

If a hereinafter described upper command lever 36a raises the command receiving portion 21a, the hook portion 9a; if the upper command lever 36a does not act, the stopper surface 22a is contacted with the upper stay 26a and in this attitude the hook 20a is not engaged with the hook portion 9a.

An upper stopper shaft 27a has both longitudinal ends fixed on the machine frame. A plurality of upper stoppers 28a, each being opposed to the upper hook 6a and the upper knife hook

19a, are pivotally mounted on the upper stopper shaft 27a, If a pawl 30a at the top end of the upper hook stopper 28a is engaged with a notch 29a of the upper hook 6a, the second pressure receiving plane 8a of the upper hook 6a is contacted with the upper stopper 10a in surface contact state thereby upper end of the vertical lever 5 is held at the left end position. A pressure receiving plane 31a is formed at lower surface of the upper hook stopper 28a. If the pressure receiving plane 31a is raised by a projection 24a of the upper knife hook 19a rotating clockwise, engagement of the pawl 30a with the notch 29a is released. A coil spring 33 is stretched between a spring hook 32a of the upper hook stopper 28a and an upper stay rod 34a having both longitudinal ends fixed on the machine frame, thereby the upper hook stopper 28a is urged in counterclockwise direction.

A lower knife hook 19b, a lower stay 26b, a lower stopper shaft 27b, a lower hook stopper 28b and the like are formed in vertical symmetry to the upper hook 19a, the upper stay 26a, the upper stopper shaft 27a, the upper hook stopper 28a and the like.

A command device 35 is a known device where an endless card with perforation corresponding to fabric pattern is transferred using a drum, the perforation is detected by a vertical needle, the needle controls height in right end of a horizontal rod, the right end of horizontal rod is pushed by a knife reciprocating in horizontal direction, and an upper command lever 36a and a lower command lever 36b connected to the left end of horizontal rod are operated. While the driving lever 13 finishes to rotate counterclockwise and begins to rotate clockwise, the upper command lever 36a raises the upper knife hook 19a to engage the

hook portion 20a with the hook portion 9a, and the knife 19a disengages the upper hook stopper 28a from the upper hook 6a. While the driving lever 13 rotates clockwise, the lower command lever 36b similarly engages the lower hook 6b with the lower knife hook 19b, and the lower knife hook 19b disengages the lower hook stopper 28b from the lower hook 6b.

Fig. 1 shows above mentioned attitude where the vertical lever is in the vertical direction, the jack lever 1 stops to rotate counterclockwise, the driving lever 13 and the driven lever 15 also stop to rotate counterclockwise, the upper command lever 36a of the command device 35 engages the upper knife hook 19a with the upper hook 6a, the upper hook stopper 28a is disengaged from the upper hook 6a, and the lower hook stopper 28b is engaged with the lower hook 6b. This state corresponds to attitude of the heald in downward position. If the driving lever 13 rotates clockwise, the upper knife hook 19a pulls the upper hook 6a rightwards, the vertical lever 5 rotates clockwise about the pin 37b and the jack lever 1 also rotates clockwise thereby the heald frame is moved upwards. When the driving lever 13 stops to rotate clockwise, the heald frame comes to the top dead center. In this state, the driven lever 15 rotates in similar manner to the driving lever 13. If the driving lever 13 and the driven lever 15 begin to rotate counterclockwise, since the upper command lever 36a does not support the upper knife hook 19a then, the upper knife hook 19a is disengaged from the upper hook 6a and rotates counterclockwise until the stopper surface 22a thereof is contacted with the upper stay 26a. Then the upper return knife 16a pushes the upper hook 6a leftwards, the vertical lever 5 rotates counterclockwise about the pin 37b, and the jack lever 1

also rotates counterclockwise, thereby the heald frame is moved downwards. When the driving lever 13 and the driven lever 15 stop to rotate counterclockwise, the heald frame comes to the bottom dead center. Although above description concerns operation of the upper knife hook 19a by the upper command lever 36a of the command device 35, when the lower knife hook 19b is operated by the lower command lever 36b, the lower knife hook 19b is engaged with the lower hook 6b before the beginning of counterclockwise rotation of the driving lever 13 and the driven lever 15, and the pawl 38a of the upper hook stopper 28a is engaged with the notch 29a of the upper hook 6a. If the driving lever 13 rotates counterclockwise, the vertical lever 5 rotates counterclockwise about the pin 37a and the jack lever 1 rotates clockwise, thereby the heald frame is moved upwards. Subsequent operation is performed in similar manner to the case of operation of the upper knife hook 19a as above described. Both two cases as above described concern the heald frame moved up and down. If neither the upper command lever 36a nor the lower command lever 36b acts, the vertical lever 5 keeps attitude as shown and the heald frame is still held in the bottom dead center. In order to hold the heald frame in the top dead center continuously, the upper command lever, for example, is operated, and when the driving lever 13 finishes to rotate clockwise and the heald frame comes to the top dead center as above described, the lower command lever 36b is operated. If the driving lever 13 begins to rotate counterclockwise, the upper hook 6a is moved leftwards and the lower hook 6b is moved rightwards. Since stroke of both hooks 6a, 6b is equal, the vertical lever 5 only rocks about the pin 3 and the jack lever 1 does not rotate, thereby the heald frame is

held in the top dead center.

If the heald frame is raised in above mentioned operations, the vertical lever 5 rotates counterclockwise (or clockwise) about the pin 37a (or pin 37b) and reaction force in the fulcrum is received by surface contact of the upper stopper 10a (or lower stopper 10b) with the second pressure receiving plane 8a of the upper hook 6a (or the second pressure receiving plane 8b of the lower hook 6b). Reaction force during downward motion of the heald frame is received by surface contact of the first pressure receiving plane 7a of the upper hook 6a (or the first pressure receiving plane 7b of the lower hook 6b) with the pressure receiving plane 18a of the upper return knife 16a (or the pressure receiving plane 18b of the lower return knife 16b). Further, reaction force during continuous holding of the heald frame in the top dead center is received by surface contact of the first pressure receiving plane 7a of the upper hook 6a with the pressure receiving surface 18a of the upper return knife 16a or by surface contact of the first pressure receiving plane 7b of the lower hook 6b with the pressure receiving plane 18b of the lower return knife 16b. Accordingly, although above mentioned portions in surface contact state are subjected to sliding action because of difference of revolution center positions of members relating to contact planes or fixed state of one plane, the surface contact state causes little abrasion.

CLAIMS

1. A positive dobby machine, comprising a jack lever for moving a heald frame, a vertical lever with center portion pivotally connected to said jack lever, hooks pivotally connected respectively to upper and lower ends of the vertical lever, return knives for moving respectively both ends of said jack lever in opposite direction to the hook moving direction, hook stoppers engaged with the hooks, and stoppers for supporting respectively the upper and lower ends of said vertical lever, characterized in that a driven lever is opposed to the vertical lever, a driving lever is installed to the vertical lever in opposite side with respect to the driven lever, the axial center of the driving lever and the axial center of the driven levers and center portion of the vertical lever are arranged approximately in a line, knife shafts are installed respectively to upper and lower ends of the driving lever, return knives are supported respectively to upper and lower ends of the driven lever, connecting members are installed integrally with respective return knives and connected to the knife shaft, parallelogram link mechanism is constituted by the driving lever, the driven lever and the return knives having the connecting members so that the return knives are moved in parallel, each return knife has pressure receiving plane at side opposed to the vertical lever, the pressure receiving plane is perpendicular to direction of line connecting between axial center of the driving lever and axial center of the driven lever and the hook has first pressure receiving plane which is opposed to the pressure receiving plane of the return knife and can be contacted with said pressure

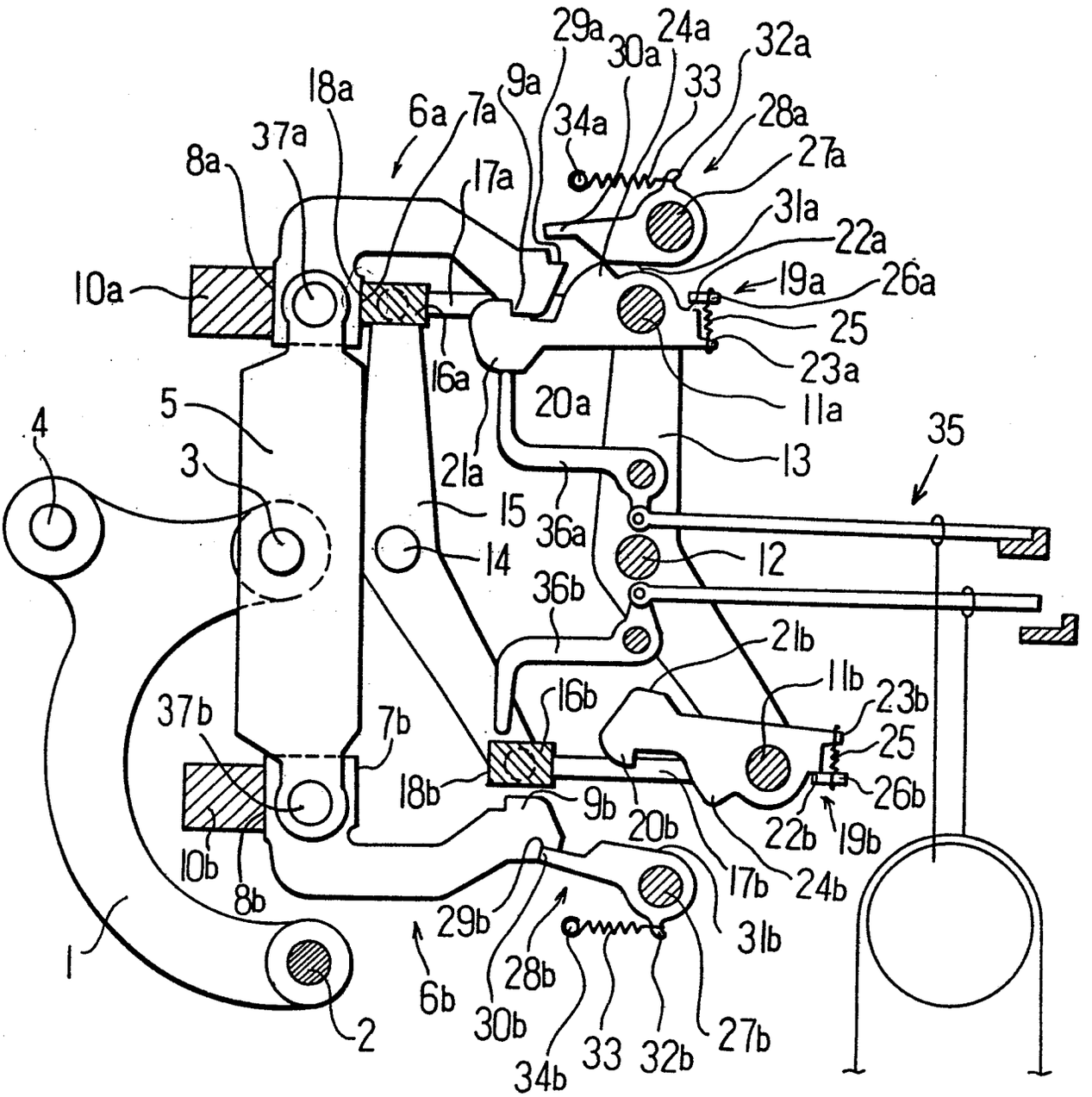
receiving plane in surface contact state.

2. A positive dobby machine according to claim 1, characterized in that a knife hook is pivotally mounted on the knife shaft, said knife hook being engaged with the hook and operated by a command device.

3. A positive dobby machine according to claim 2, characterized in that the hook stopper is interlocked with the knife hook.

4. A positive dobby machine according to claim 1, characterized in that the hook has second pressure receiving plane which is opposed to and in parallel to the first pressure receiving plane, and the stopper has pressure receiving plane which can be contacted with the second pressure receiving plane in surface contact state.

Fig. 1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34b
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32b

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP 81/00425

0084570

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[3] D03C1/06, D03C1/26

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC	D03C1/06, D03C1/14, D03C1/26, D03C1/28, D03C1/30, D03C1/32

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Kogo 1926 ~ 1981
Kokai Jitsuyo Shinan Koho 1971 ~ 1981

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	JP, B1, 47-5464, 1972-2-16 (Yamada Dobby Co., Ltd.)	1-4
A	JP, B1, 47-28431, 1972-7-27 (Steubrie A.G.)	1-4

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published on or 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

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
March 25, 1982 (25.03.82)	April 5, 1982 (05.04.82)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	