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SYSTEM FOR FITTING WINDOWS OF BUILDINGS.

System for fitting windows of buildings and other uses, comprised of a frame (4) whose dimensions are adjusted to the window opening and to which is mounted a special blind (1, 2, 3) replaceable for the summer (mosquito net effect) or for the winter (double glazing effect). The design allows an optimum regulation of sun light, while saving energy for heating or cooling. The regulation may optionally be automatic since an electronic circuit provided with a photoelectronic sensor allows the blind (1, 2, 3) to be self-regulated, as the sun changes its position, without intervention of the user. The control may be remote with interconnection by means of an electric cable to the window.

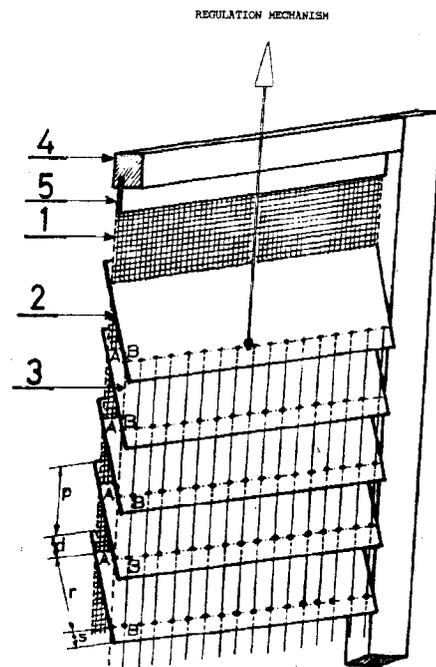


FIGURE 1

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GENERAL INTRODUCTION

The usual components for fitting windows of buildings include:

- a) Glazing components with their frames, fixed or unfix-
ed, single or double (hinged win-
dowpane, slidable or fixed; with single or double
configuration/shape); the main functions of which
are to stop the air, foreign objects, animals and
insects. Likewise the thermal losses are reduced
through the window opening, improving the en-
ergy ratio of the building, and making possible
to see through.
- b) External components before the first glazing
to control the sun radiation that affects the win-
dow opening (external blind, shutter, marquee).

The main function of these components is to
control the solar energy flow on the window,
preventing the heat from flowing through the
window opening, mainly with hot weather. The
regulation is made by the user within the possi-
ble boundaries of his own systems (half opening
of the shutter, to put the blind in one of its
possible regulation positions, to use marquees,
etc,...). The best regulation that the user wants
would be the one that gets enough illumination
level into the room with the flow of diffused light
reflected by the sun, but not the direct sun-
beams. This requirement is not in the majority of
the usual solution of the external components,
so that, these components normally do the regu-
lation to prevent the flow of some sun radiation
on some areas, but allowing the flow of direct
sun radiation in others.

These components can sensibly improve
the energy ratio of the building, reducing cooling
energy (cost) in hot seasons; and in lower quan-
tity, in some cases, it could reduce thermal
losses of the heating.

The saved energy ratio in the installations is
different, depending on the kind of installation,
but, in all the cases, if the user wants to have a
good ratio, it is necessary to control the system
depending on weather condition and solar radi-
ation.

- c) Protective components against the flow of
insects and other animals (mosquito net effect,
dust net effect, etc). The main function of these
components is to stop the flow of insects,
sheets, etc. As the glazing is open allowing the
flow of air for ventilation.

These components are indistinctly used be-
fore or behind the glazing; and his shape is a
net with a fit sized hole to impede the flow of
foreign object that we want to stop, and it is
necessary a good fitting to the window opening.

- d) Inside components at the first glazing (inside
blind, blind between double glazing, curtain, lace

curtain, etc) these components have not a main
thermal function.

Normally, the reasons of their use are aes-
thetic, and they are integrated into the building
interior decorating and the place where the window
is. These kinds of components could help regulate
the sunlight; they slightly contribute to improve the
energy ratio and sometimes have a use like mos-
quito net effect, all these contributions are sec-
ondary, so that all components mentioned above are
specifically used for these functions.

In state of the art window equipments, all the
components mentioned before are used in a great
deal of combinations. The majority of these com-
binations are made irrationally.

From the energetic point Of view, all the sys-
tems used, like interior blinds are ineffective in hot
seasons. The first glazing creates the "Green
house effect", and allows full incident solar radi-
ation. Likewise it cannot return the reflected sun
radiation by the objects that are behind the glazing.

It is the effect used in the "Sun collector". All
the blind or curtain systems used behind the first
glazing give a long energetic flow "outside-inside",
and this energetic flow increases the temperature.

If a comfortable temperature is maintained in a
room, it is necessary to reduce the energy in
excess with air conditioned. The compensation of
these effects is one of the most important costs in
air conditioned systems and it is necessary to have
a bigger installation.

The modern architecture propose the maxi-
mum space with glass in the façade, it is a con-
tinue succession of windows. It is a good way, so
that it is not only an aesthetic effect but also a
good way to get sunlight, the glass has a good
environmental behaviour, it is the best means to get
a good exterior view, it is very easy to clean and to
conserve; however the problem with the sun
charge is very big with this trend. All the tries to
reduce the problem using blinds in the middle of
the double glazing, using special glasses which
have absorption or reflection effect of the sun radi-
ation: using things like "climatit" or others... are
very poor solutions, comparing with the use of
exterior blind with a rational design.

The rational blind would prevent the flow of the
direct sun radiation but it allows the entry of diffuse
and reflected light, and the room would have natu-
ral illumination. The refrigeration charge due to
solar radiation is decreased with this method.

One solution for this problem is to use the
blinds with "revolving sheets" that having a good
position reduce all the direct sun radiation because
the sheets are overlap with a partial opening, but it
is possible to have the diffused and reflected light.
The geometry configuration of this solution is used
in the "Venetian blind", that has a batch of thin

sheets situated parallelly one over the other and they are fit with strings or bands, whose angular position is activated with strings or pulleys. This kind of blind is used all over the world, but is normally used inside and it is also under the "Green house effect". Its exterior use is not possible because it has not a resistance structure; and it cannot withstand the wind. Physically, the same problem happens with vertical sheets.

The solution is usually to use blinds with roll up sheets; the structure concept is good because the normal wind charge is supported normally, but it does not allow to repel the direct sun radiation and if it is necessary a good illumination level. It also has a big box in the high position of the window, and this box is an architectural and constructive problem, above all in the big windows. The reliability of these blinds is very bad, these broken easily and sometimes these have air leaks as a consequence of bad seals.

It is possible to open the window in the buildings that do not have air conditioned systems and it is a normal attitude to open the window hence for reducing the "Green house effect". In this situation, it is very easy for dust or insects to flow through the window. In some places, the flow of insects is an important problem and it is necessary to use "mosquito net effect". The rational blind design has to consider this kind of configuration in hot seasons.

With cold temperature, the glazing shall be closed because it has a good thermal protection, while the blind is open because the light is not enough. In this condition, the thermal protection of the glass is the only heating resistance, and it is very poor for normal glasses. So the heating lost through the glass is very important in a standard window and with cold weather. This affects the heating cost. Normally, it is used the double glazing effect, that is thermally good, but expensive and it has cleaning problems. The rational blind has to have a good solution for thermal losses doing the same effect that the double glazing in cold seasons.

There are other requirements, besides the above mentioned (external sun radiation protection in hot season, thermal protection against the thermal losses in cold seasons, the mosquito net effect for the buildings without air conditioned in hot season, etc), like the following list:

- The blind shall be able to pick up when the user wants, In this case, it is possible to have the maximum, view.
- The blind shall be able to turn when the user needs complete dark (for instance when the user sleeps during the day).
- Sometimes the user has marquees because he wants a shadow on the window. These

requirements must be contemplated like an option in a rational blind.

- The control system must be easy to handle. In this requirement, automatic control system shall be considered. This system regards linear climate parameters and sun position, The automatic control system selects the optimum position of the blind to have the best energetic ratio, in winter and in summer. The control system must have a switch with two positions AUTOMATIC/HANDLY. The user selecting the automatic position can forget the regulation of the blind. The control system must be placed in the best place (for instance near the bed in the bedroom, in the table of the bureau, etc).
- The integrated structure must be guaranteed against high speed of the wind. The components must have a high reliability and a long life in service.
- From the user and architect aesthetic point of view, it must be the same or higher that in normal blinds.
- The costs must be the same or lower than those of normal blinds having the considerations about saving energy.
- The installation on windows that are in actual buildings must be easy and economic.
- The maintainability must be minimum (in all cases, the same or lower than in normal blind).

All these requirements must be complied by the equipment of the rational window; and this is the aim of the system proposed in this invention patent.

DESCRIPTION OF THE SYSTEM SUBJECT TO INNOVATION

The present innovation applies to the equipment of the window for the buildings with different functions. The description of the system is thorough. The use is under all these potential functions, but it is possible to choose individual things, depending on the user requirements. In the attachment "CLAIMS" the concepts of innovations are specified with the function required, but not the place of application.

The main component of the system is the "mosquito net effect" blind; it is shown in figure 1, in the extended position (no pick up). This component has one transparent plane element (1) to the light but the flow of insects and other objects is stopped, provided that foreign object has enough size. The transparent plane is the base of the elements whose name is "SHEET" (2). The union in made with joints (A). The sheet have a rectangular shape, with one of the longer sides onto the

hinge (1); the other longer side has a hinge (B) too, with the mobile element (3); also it is plane; it has the same characteristics that the element (1) or to be only a assembly of strings or strips. The planes of the elements (1) and (3) are always parallels.

The element (1) is supported perimetrically on its dedicated support (4) that fits in the window frame or in the window opening. The material of these elements (1) and (3) can be a net, a plastic film, a glass, a joint of ribbons or threads depending on the applications, but always having high transparency to the light.

It is possible to move the element (3) parallel to (1), so that the articulations (A) are fixed and the articulations (B) are movable in a circle with a radius (r) and with its centre in (A). With this configuration the angle (-) of the sheets is defined by the position of the regulation mechanism (6).

The sheets (2) are rectangles and the section is defined, depending on the net (4) size and characteristic and the dimensions (d), (r), (s) and (p).

The articulations (A) and (B) can have different constructive solutions. They could be hinges or holes in the elements (1) and (3) and penetrations of the elements (2) or viceversa; or it is possible also to do a simple fold to the elements (1) and (3) over the sheets (2), etc.

The sheets (2) are made of opaque material, plastic, wood, etc. Also it is possible to retract the joint of the sheets (2) and the elements (1) and (3). The sheets are run up, and the elements (1) and (3) are folded. All the joint is situated on the top side of the net and the window is free of the elements. The mechanism is automatically run up by means of strings and pulleys with an electrical engine, or manually; depending on the option selected. Figure 2 shows a representation of the partial position.

The joint of element (1), sheets (2) and element (3) are hanging on the element called "hanger" (5). The hanger keeps up the top side of the element (1) and the hanger is easily kept up at the top of the net (4). The joint of elements (1), (2), (3) and (5) is replaceable for the winter and the summer. The spare for the winter has the transparent elements (1) and (3). The spare for the summer allows the air flows but not the insects. The net (4) is normally fixed to the opening window, but sometimes, if the customer wants, it is possible to put hinges on the top of the window opening; with this option all the joint is used like a sunshade (fig. 3). The mechanism (6) used to put the sunshade configuration has a system with strings and pulleys. The movement can be automatic or manual. It has an option with lateral fan-shaped elements; with this option the flow of sun radiation is stopped in some sun positions.

The geometry configuration of the blind, integrated by the elements (1), (2), (3), (4) and (5) is represented in figure 1. It has a solution with the articulations A and B of the sheets (2) in horizontal position. The solution that has the articulation A and B in vertical position, is right too.

The position of the net (4) is normally vertical, but it is possible to use the system in horizontal or inclined angle.

It is possible to write a summary with the application of these components; it is a guide information but not limited: Windows, doors, screens, vertical or inclined skylight, roofs with illumination shadows in terrace, green houses, etc. The supply of these elements can be manufacture products or elements "to do-it-yourself".

The second important component is the control system: The cheaper solution the user select the blind position manually or through an "electro-mechanic" system. In manual action, the user has to go to the window and run up or run down the sheets to regulate the sun radiation, etc. These operations are done as in conventional blind systems.

In the electro-mechanic action the blind has a system, with electric engines, that has the capability to select the appropriate position. The user has a control box with switches. The box can be near or far from the window, and the box is connected with an electric cable to the blind. However, the user sometimes in a day has to push the switch if he wants to keep enough illumination without sun radiation in the room.

There is an automatic option. In this option, the user does not have to do any change in the position of the blind with the change of position of the sun. The blind is an "intelligent system". The blind has a sun radiation sensor on the element (1). The sensor is always positioned towards the exterior when the sensor received a direct sun radiation it gives an order to change the sheet angle until the sensor does not receive the direct sun radiation. In this condition, the room has enough light but does not receive the direct sun radiation.

The logic of the system is very simple (fig.4), so that the system wants to keep a flow of illumination through the window between two values; I_{max} and I_{min} . If the illumination is between the two values, the system does not do anything. If the incident illumination is bigger than I_{max} the system gives an order to close the sheets and the illumination becomes less or equal to I_{max} . When the illumination received on the sensor is less than I_{min} , the system gives the order to open the sheets.

The interval between I_{max} and I_{min} will be selected by the user in order to have the best comfort in the room. The electronic system is very

easy to be made with "Photo-Diode" and "Photo-resist", and this circuit is made and tested.

This option has all the switches of the electro-mechanic system and one switch for manual or automatic.

In figure 5, it is represented the control box; it is only a schematic representation.

Claims

1. System for fitting windows of buildings and other uses. It is distinguished because it is integrated for two components. The first component works like a blind to control the sun radiation (figure 1), and it has the mosquito net effect with summer spare and double glazing effect with winter spare. It improves the window acoustical and thermally. The second component is an automatic system with a "Photo-electric" sensor (figure 4 & 5), that has the capability to monitor the sun position and regulate the first component of blind and the user can forget the blind regulation. 15
2. System for fitting windows of buildings and other uses according to claim 1st, it is distinguished because the composition of the first component has a frame (4) that is fit to the window opening and it is the support of a joint, it can be changed, which has the function of blind plus mosquito net effect in summer of the function of blind plus double glazing effect in winter. 25
The frame is also the support for all the mechanism and regulation system. 30
3. System for fitting windows of buildings and other uses, according to the claim 2nd, it is distinguished because the spare joint has two superficial elements whose dimensions are adjusted to the frame; these are transparent to the light but do not allow the flow of strange objects with a determined size. The first of these superficial elements (1), it is hanging on the top edge by an element with "hanger effect" (5); that it is hanging on the frame. The second superficial element (3) is parallel to first and can be moved paralelly to the first. Between these superficial elements there is a joint of parallels sheets (2); and the union with the two superficial elements in made with joints. A perpendicular section to the big side of the sheets gives a joint of deformable parallelograms with one degree of freedom when moving, being this degree of freedon defined by the vertical movement of the second superficial element, which is actuated by the regulation mechanism (figure 1). The inclina- 40
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tion angle of the sheets is changed; and it is possible to control the light that it is bringing in the room. The geometry configuration described for vertical movement of the second vertical element, it can be also possible used in horizontal; in this case the sheets are vertical, but with the same mechanic concept.

4. System for fitting windows of buildings and other uses, according to joint frame and blind distinguished because the joint frame and blind (figure 1) can he turned until having the umbrella configuration, because the frame is joined to the opening window in the top. 10
5. System for fitting windows of buildings and other uses, according to vindicatins 1st and 2nd is distinguished because the second component has a light sensor placed on a right situation, and this sensor detects shadow caused by the sheet. The sensor is a transducer to control the electronic circuit and the electro-mechanic elements that have the automatic regulation (figure 4). 15
6. System for fitting windows of buildings and other uses, according to claim 5th, is distinguished because the automatic system can be optionally made in a control box (figure 6), it has the switches and the electronic circuit based on the logic of figure 4, allowing the user automatic operation and a remote control so that the control box can be separated from the window, and it is connected by means of its appropriate interconnecting electric cable. 20
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Amended claims

1. Integral system for fitting windows of buildings and other uses that has another use optionally the function of automatic blind, "mosquito net effect", double glazing effect and marquee. It is distinguished because it is integrated for two components. The first component works like a blind to control the sun radiation (figure 1), and it has the mosquito net effect with summer spare and double glazing effect with winter spare. It improves the window acoustical and thermally. The second component in an automatic system with a "Photo-electric" sensor (figure 4 & 5), that has the capability to monitor the sun position and regulate the first component of blind and the user can forget the blind regulation. 40
45
50
55
2. Integral system for fitting windows of buildings and other uses according to claim 1st, it is distinguished because the composition of the 5

first component has a frame (4) that is fit to the window opening and it is the support of a joint (5), (1), (2), (3); it can be changed easy and quickly, which has the function of blind plus mosquito net effect in summer of the function of blind plus double glazing effect in winter.

The frame is also the guide rail for the blind when the sheets are hoisted, and the support for all the mechanism and regulation system.

3. Integral system for fitting windows or buildings and other uses, according to the claim 2nd, it is distinguished because the spare joint has two superficial elements whose dimensions are adjusted to the frame; these are transparent to the light but do not allow the flow of strange objects with a determined size. The first of these superficial elements (1), it is hanging on the top edge by an element with "hanger effect" (5); that it is hanging on the frame. The second superficial element (3) is parallel to first and can be moved paralelly to the first. Between these superficial elements there is a joint of parallels sheets (2); and the union with the two superficial elements is made with joints. A perpendicular section to the big side of the sheets gives a joint of deformable parallelograms with one degree of freedom when moving, being this degree of freedom defined by the vertical movement of the second superficial element, which is actuated by the regulation mechanism (figure 1). The hinges are made of flexible elements inserted in the edge sheet. If the second element is moved vertically the inclination angle of the sheets is changed; and it is possible to control the light that it is bringing in the room. The geometry configuration described for vertical movement of the second vertical element, it can be also possible used in horizontal; in this case the sheets are vertical, but with the same mechanic concept. Th solution allows to hoiste the sheets pileing up and folding the plane elements (figure 2); byu means of the rails that are in the vertical side of the frame (4). Theses rails guide the hinge edge of the elements (2) and (1).

4. Integral system for fitting windows of buildings and other uses, according to joint frame and blind distinguished because the joint frame and blind (figure 1) can be turned until having the umbrella configuration, because the frame is joined to the opening window in the top.

5. Integral system for fitting windows of buildings and other uses, according to vindicatins 1st and 2nd is distinguished because the second

component has a light sensor, placed on the frame in a right situation, and this sensor detects shadow caused by a sheet. The sensor is a transducer to control the electronic circuit and the electro-mechanic elements that have the automatic regulation (figure 4).

6. Integral system for fitting windows of buildings and other uses, according to claim 5th, is distinguished because the automatic system can he optionally made in a control box (figure 5), it has the switches and the electronic circuit based on the logic of figure 4, allowing the user automatic operation and a remote control so that the control box can be separated from the window, and it is connected by means of its appropriate interconnecting electric cable.

REGULATION MECHANISM

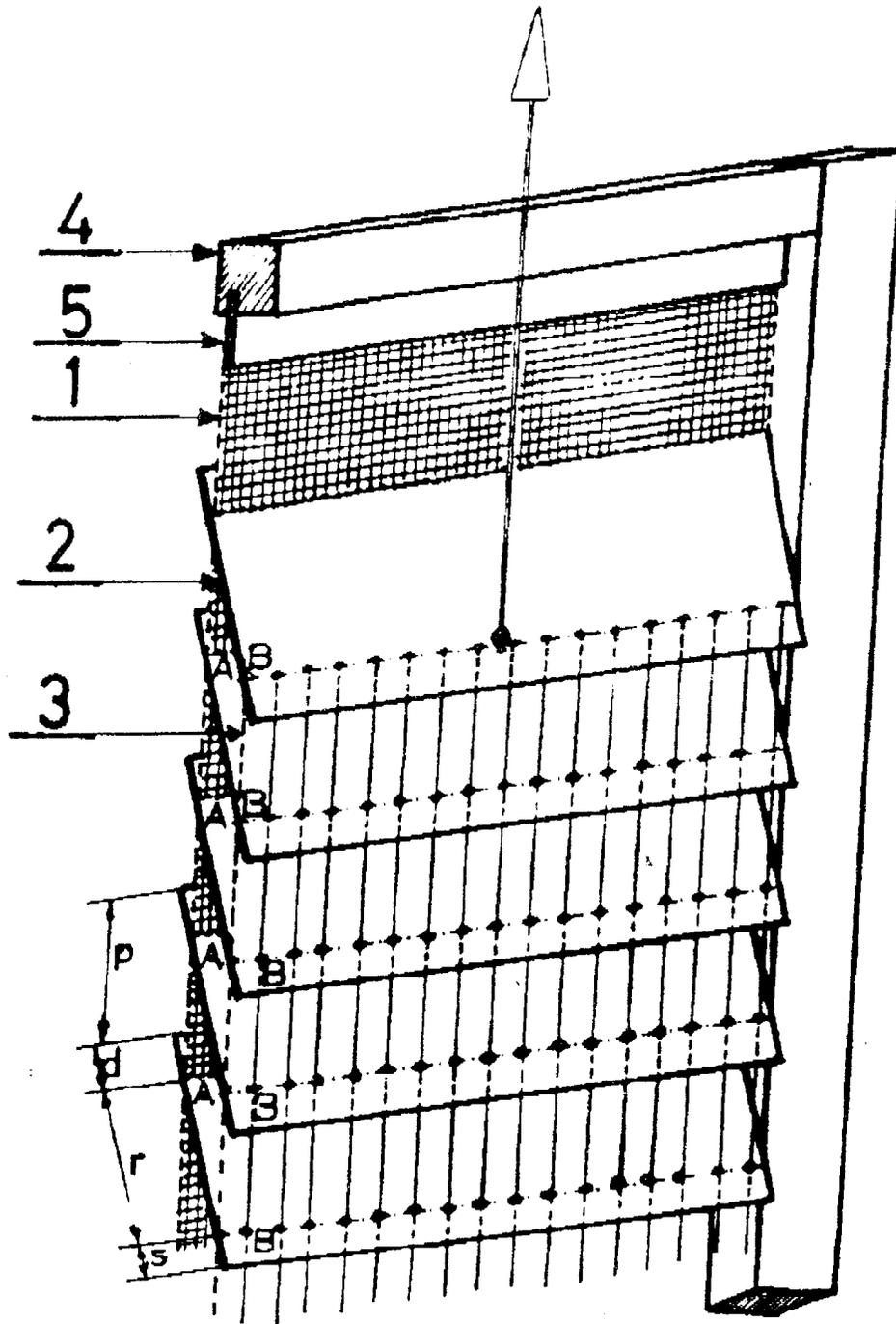


FIGURE 1

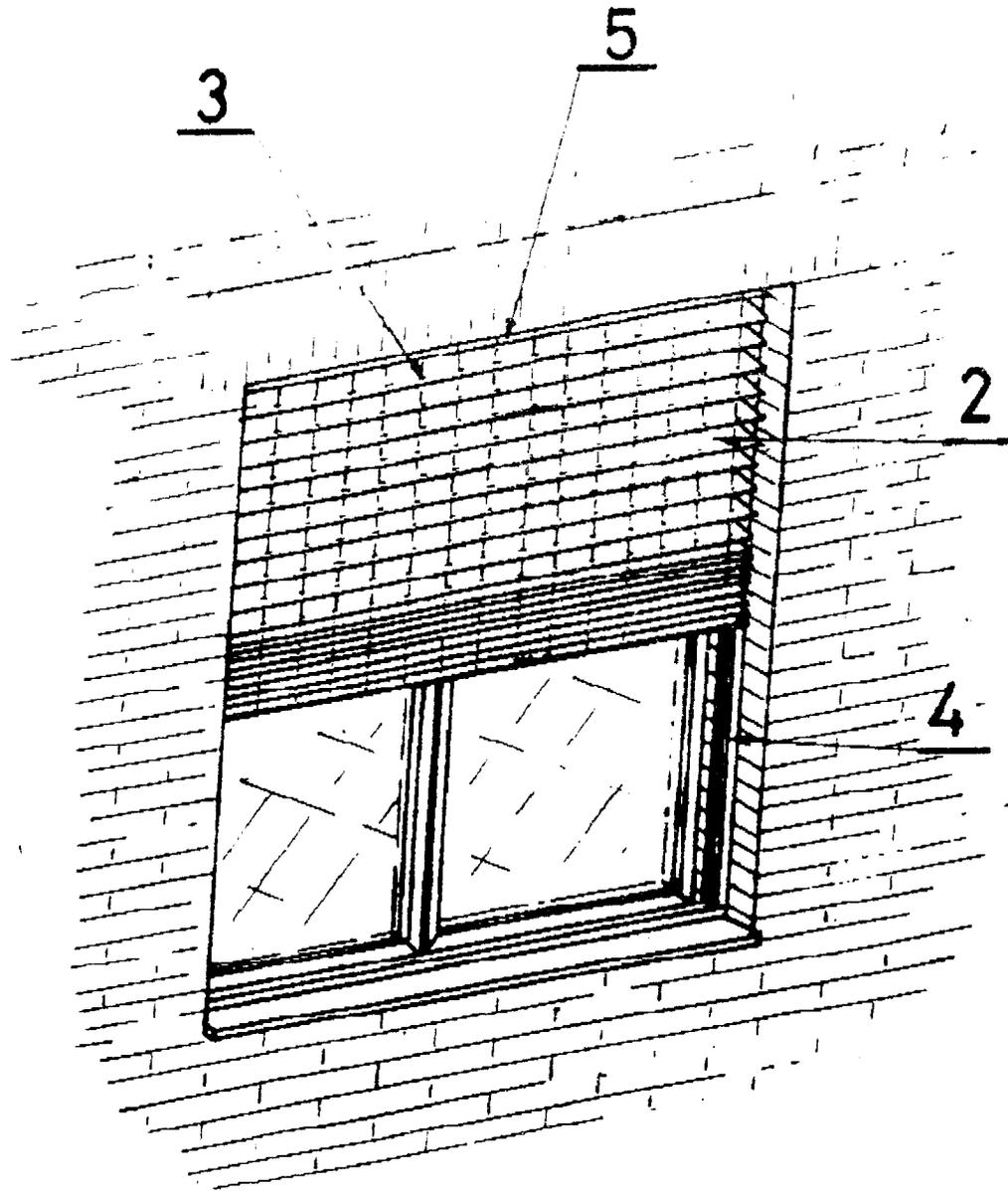


FIGURE 2

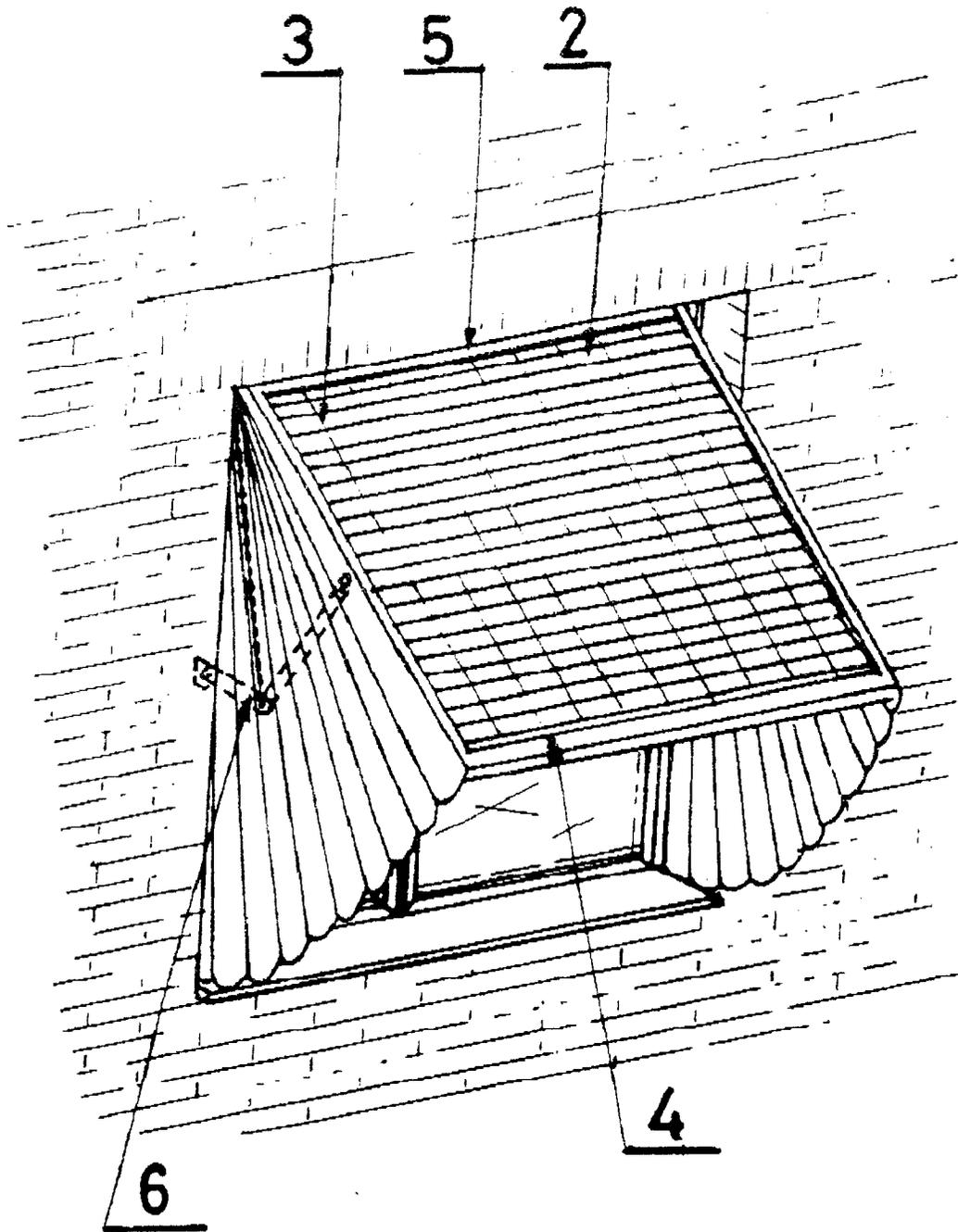


FIGURE 3

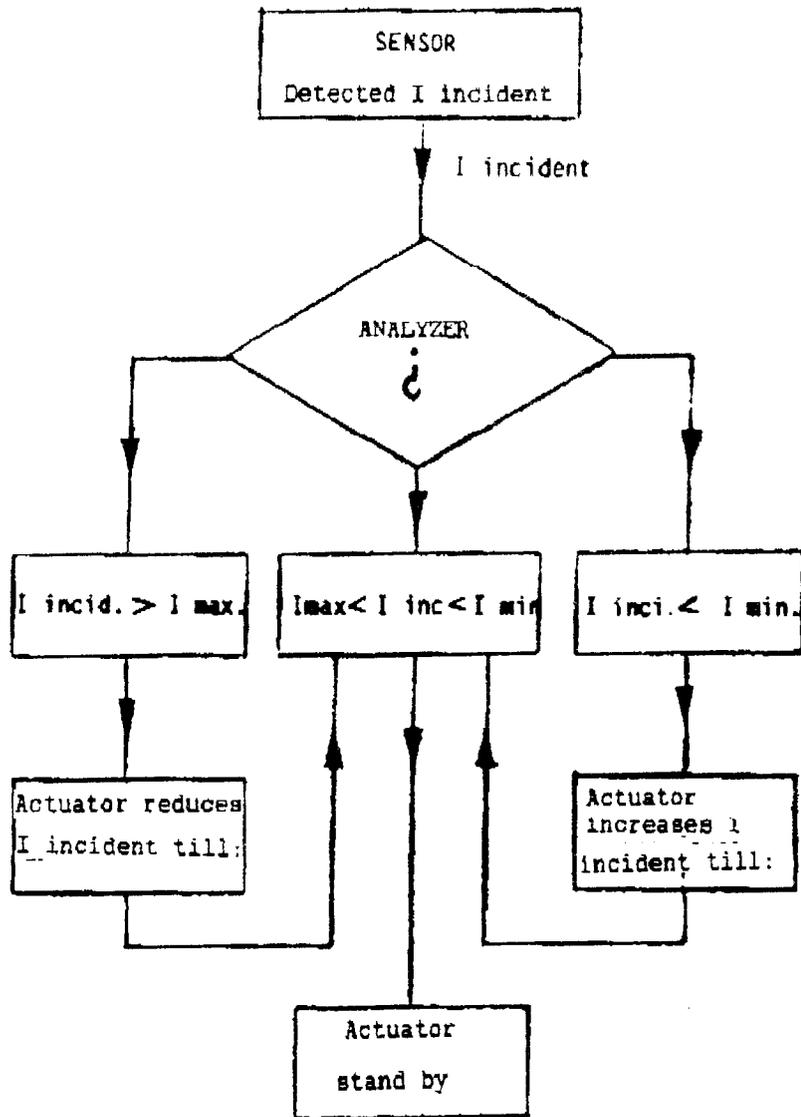


FIGURE 4

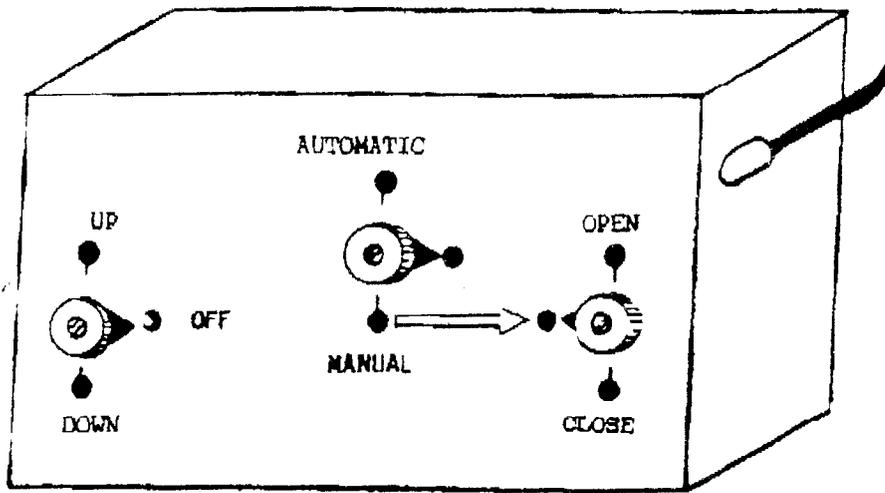


FIGURE 5

INTERNATIONAL SEARCH REPORT

International Application No **PCT/ES 90/00010**

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) * | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC | | |
| Int. Cl. ⁵ E 06 B 9/262, E 06 B 9/30 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁷ | | |
| Classification System | Classification Symbols | |
| Int. Cl. ⁵ | E 06 B | |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸ | | |
| | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ | | |
| Category ⁹ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ |
| Y | US, A, 3646985 (KLANN) 7 March 1972, see column 1, lines 6-28; column 2, line 35 - column 3, line 26; figure 1 | 1-6 |
| Y | FR, A, 2252477 (R. FLOCH) 20 June 1975, see page 5, lines 14-30; figures | 1-6 |
| Y | FR, A, 1364674 (M.P. FROGET) 19 May 1964, see page 1, left-hand column, lines 10-13, right-hand column, paragraphs 3-5; page 2, left-hand column, paragraphs 9,10,12, right-hand column, paragraphs 1,2,4,6; claim 3; figures | 3 |
| ./. | | |
| <p>* Special categories of cited documents: ¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> | | |
| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report | |
| 18 May 1990 (18.05.90) | 14 June 1990 (14.06.90) | |
| International Searching Authority | Signature of Authorized Officer | |
| European Patent Office | | |

