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(12) # EUROPEAN PATENT APPLICATION

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(54) **Closure structures.**

(57) Hinges between panels of an overhead door for an opening of industrial premises are defined by configurations (6, 7, 14) which form integral parts of the panel edges, if desired in conjunction with inserted auxiliary members (15).

The panel edges may be defined by rigid aluminium extrusions (1,2) and these may have parallel slots to receive and retain panel facing sheets (18,19). Thermally insulating material (21) may be packed between the facing sheets.

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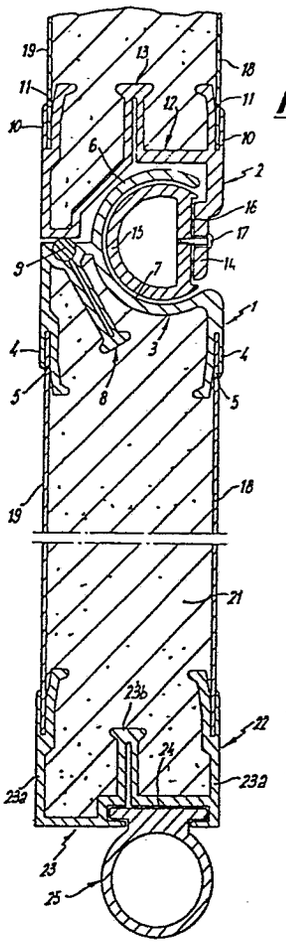
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CLOSURE STRUCTURES

This invention relates to a closure structure of the kind, hereinafter referred to as the kind described, which has a plurality of panels joined in edge-to-edge disposition by hinges and which, in use, is movable across an opening, such as a doorway of industrial premises, towards and away from a closed position at which the opening is covered by the structure, the hinges permitting flexing of the structure during such movement to accommodate, for example, negotiation of a curved path.

With a known closure structure of the kind described which is an overhead door, opposite ends of the panels have rollers thereat which run in tracks having straight portions extending substantially vertically at opposite sides of the opening and linking via curved portions with straight substantially horizontally extending overhead portions. With this arrangement it is known to join each pair of adjacent panels with a number of

separate hinges which are individually riveted to the panel edges. This involves however time-consuming and expensive manufacturing procedures and an object of the present invention is to provide a hinge joint for a closure structure of the kind described which can be assembled in a simpler and more convenient manner.

According to the invention therefore there is provided a closure structure of the kind described wherein the hinges joining the panels are defined at least partially by configurations extending longitudinally and constituting integral parts of the panel edges.

With this arrangement it will be appreciated that multiple riveting operations can be obviated whereby it is possible to effect assembly of the hinge joints of the closure structure in a simple convenient and inexpensive manner.

Most preferably, the panel edges are defined by elongate rigid members, particularly extruded aluminium sections, and these are adapted to support and retain one or more plates or sheets, such as aluminium facing sheets. Such elongate members may extend wholly or substantially wholly across the panels between opposite ends thereof and may be shaped such that the members of adjacent panel edges have complementary configurations and interfit with each other to define the pertaining hinge joint. Alternatively, an auxiliary elongate element may be provided which in combination with the members of the adjacent panel edges forms an arrangement of complementary configurations which interfit to define the hinge joint. Such element may be secured as by screws or the like to one such member and may comprise

for example a D-section hollow structure.

Said members may have a slot or slots therein to receive at least one sheet or plate as aforesaid. Preferably the arrangement is such that a pair of sheets can be mounted in spaced-apart parallel disposition in each panel and the space between the sheets may be filled with a rigid plastics foam material (preferably formed in situ) to impart structural strength and also good thermal insulation properties. Also with a view to providing good thermal insulation properties, a sealing member may be provided between abutting surfaces of adjacent panel edges, and the said elongate members may have barrier portions which are formed to restrict thermal conductivity through the members without unduly adversely affecting the structural strength thereof.

The closure structure of the invention may take any suitable form and may be used for any suitable purpose although it is anticipated that it will find particular application as an overhead door for industrial premises as hereinbefore described.

The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Fig. 1 is a sectional view of one form of a closure structure according to the invention;

Fig. 2 is a diagrammatic perspective view of one panel of the structure of Fig. 1 together with an associated track as used therewith;

Fig. 3 is a sectional view showing a modification of the arrangement of Fig. 1.

The closure structure is an overhead door as used in a doorway of industrial premises and comprises a plurality of panels of rectangular form each having the two long edges thereof defined by extruded aluminium sections 1, 2.

As shown in Fig. 1, the section 1 at the top edge of each panel is in the form of a channel having a bottom wall 3 and two side walls 4 with slots 5 therein. The bottom wall 3 has an integral flange 6 on its outer face and the flange 6 and the bottom wall 3 are shaped to define an elongate part-cylindrical socket 7 extending throughout substantially the entire length of the panel between opposite short end edges thereof. The opening of the socket 7 is on the inside of the panel (i.e. it faces towards the inside of the industrial premises). Between the socket 7 and the outside of the panel there is a barrier section 8 on the inner face of the wall 3, that is a section providing a long narrow path and therefore poor thermal conductivity between the inside and the outside of the member 1. On the outer face of the bottom wall 3 there is a groove at the location of the barrier section 8 and a neoprene insert 9 is retained therein.

The section 2 at the bottom end of each panel (except the bottom panel as described later) is also in the form of a channel having two side walls 10 with slots 11 therein and a shaped bottom wall 12. The bottom wall 12 contains on its inner face a barrier section 13 like the section 8 and on the outer face of the bottom wall 12 at the inner side of the member 2 there is a projecting flange 14.

The socket 7 of each member contains a D-section

aluminium extrusion 15 which is of complementary configuration to the socket 7 and is free to swivel therein, and the flat face 16 of this extrusion 15 is fixed by screws 17 to the flange 14 of the adjacent member 2. In this way a hinge joint is defined between the long edges of adjacent panels. It will be noted that the bottom wall 12 of each member 2 is shaped to provide a longitudinally extending recess or channel to receive the flange 6 of the associated member 1 whilst permitting engagement of an adjacent flat portion of the wall 12 of the member 2 with the insert 9 of such member 1.

Each panel has two plates 18, 19 extending in spaced parallel disposition respectively on the inner and outer sides thereof, such plates fitting tightly in the slots 5, 11. Channel sections 20 (see Fig. 2) are secured between the members 1, 2 at the opposite short ends of each panel, and the space between the plates 18, 19 bounded by the members 1, 2 and channel sections 20 is filled by injection with a rigid plastics foam material 21 which imparts structural rigidity and also thermal insulating properties to the panel. The channel sections 20 may be of similar construction to the sections 1 and 2 in that they have bottom walls, slotted side walls and barrier sections, although the bottom walls thereof are flat (i.e. they have no projecting flanges or recesses or inserts).

The top section of the top panel may be of like construction to the sections 20 rather than the sections 1.

The bottom panel of the closure structure, as shown in Fig. 1, has at the bottom edge thereof, an aluminium

extrusion 22 which is similar to the bottom extrusions 2 in that it is in the form of a channel having a bottom wall 23, slotted side walls 23a and a barrier section 23b but, on the outer face of the bottom wall 23, there is a groove 24 in which is mounted a flange of a resilient rubber or plastics tube 25.

At the opposite short ends of each panel, rollers 26 are secured to the ends of the top sections 1 and project from the panel for engagement with tracks 27 which run vertically at opposite sides of the door opening and link via curved portions 28 with overhead horizontal portions 29 (only the track at one side is shown in Fig. 2).

A drive mechanism 30 of suitable form, for example a motor-driven drum above the doorway around which is wrapped a cable 31 connected to the bottom edge of the bottom panel, is provided to effect powered lifting of the door from a closed position at which the door is located between the vertical portions of the track 27 and covers the doorway, and an open position at which the door is located between the horizontal portions 29 of the track 27 and the doorway is not covered. Provision may be made for ready upward movement of the door by hand as for example by using a spring or the like to counterbalance the weight of the door; and the door may be movable from the open position to the closed position by hand and/or by reverse powered action of the drive mechanism 30 as desired.

With the embodiment described the hinge joints between the panels can be manufactured and assembled in a particularly simple, convenient and inexpensive manner. It is not necessary to perform multiple riveting or

other time-consuming fixing operations: the D-section elements 15 are simply inserted into the sockets 7, adjacent members 1, 2 are interengaged with each other, and the flanges 14 are screwed to the elements 15.

Advantageously, the elements 15 can be inserted into the sockets 7 through the open longitudinal sides thereof with the elements at 90° to the position shown in Fig. 3, such elements then being rotated axially through 90° to complete the insertion. Thus, it is not necessary to have access to the ends of the sockets 7 and this facilitates assembly, particularly in the case where, for example, a damaged panel is to be replaced in situ on an installed door.

Further, the resulting door structure can ensure good protection against heat loss through the doorway. This protection arises as a consequence of the thermal insulation material 21 between the sheets 18, 19 due to the thermal conductivity barriers defined by the sections 8, 13 due to the inserts 9 which effect sealing between adjacent panels, and due to the tube 25 which engages the ground surface at the bottom of the doorway and seals the door relative thereto.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only.

Thus, for example, if desired the barrier sections may be omitted from all channel sections and, as shown in Fig. 3, the bottom walls 12 of the sections 2 may be shaped to provide curved rather than angular recesses, and the inserts 9 may be omitted from the sections 1.

The tube 25 on the bottom section may be particularly advantageous in the case of electrically operated doors in so far as the interior of the tube can be used as a pneumatic actuator for a safety switch which reverses the downward movement of the door in the event that the tube engages and is compressed by a person or object trapped beneath the door. In this case a limit switch would be provided to de-actuate the safety switch when the door is at its normal limit of downward motion and the tube engages the ground surface.

Where the door is manually operated, or in the case where the tube 25 is not required for use to actuate a safety switch, it may be preferable to use a pair of (inboard and outboard) rubber or plastics skirts for sealing engagement with the ground surface. Such skirts may have beads at their top edges which are inserted into so as to be retained within circular or other cross-section grooves set into the base of the section 23. Conveniently, the bottom section 23 may be provided with the groove 24 centrally thereof and the above-mentioned bead-receiving grooves may be provided on opposite sides of this groove, whereby the section 23 can then be used with either kind of sealing arrangement as desired. The top section of the top panel may be of like form to the section 23.

Although Fig. 2 shows a track with the top section 29 thereof extending horizontally, if desired, such top section may extend vertically or at any desired intermediate angle.

Claims:

1. A closure structure of the kind having a plurality of panels joined in edge-to-edge disposition by hinges and which, in use, is movable across an opening towards and away from a closed position at which the opening is covered by the structure, the hinges permitting flexing of the structure during such movement,
characterised in that
the hinges joining the panels are defined at least partially by configurations (6,7,14) extending longitudinally and constituting integral parts of the panel edges.

2. A closure structure according to claim 1, characterised in that
adjacent said configurations of adjacent panels are complementary and are adapted to interfit with each other to form the respective hinge joints.

3. A closure structure according to claim 1, characterised in that
adjacent said configurations (6,7,14) of adjacent panels are adapted to interfit with each other and with respective separate auxiliary elongate elements (15) to form the respective hinge joints.

4. A closure structure according to claim 3, characterised in that
each said auxiliary element (15) is a D-section member which is secured to a projecting flange (14) of said configuration of one panel and pivotably engages a curved socket (6, 7) of the other said configuration of the adjacent panel.

5. A closure structure according to any one of claims 1 to 4, wherein the panel edges are defined by elongate rigid members which are adapted to support and retain facing plates or sheets of the panels characterised in that said configurations (6, 7,14) are formed by shaped parts of said elongate rigid members (1, 2).

6. A closure structure according to claim 5, characterised in that each said elongate rigid member (1, 2) has at least one slot (5, 11) therein to receive and retain said panel facing plate or sheet (18, 19).

7. A closure structure according to claim 6, characterised in that each said elongate rigid member (1, 2) has therein a pair of side-by-side longitudinally extending slots (5, 11) to receive and retain respective panel facing plates or sheets (18, 19) in spaced-apart disposition.

8. A closure structure according to claim 7, characterised in that the space between said plates or sheets (18, 19) is filled with thermally insulating material (21).

9. A closure structure according to claim 8, wherein said material (21) is a rigid foam plastics material which is formed in situ.

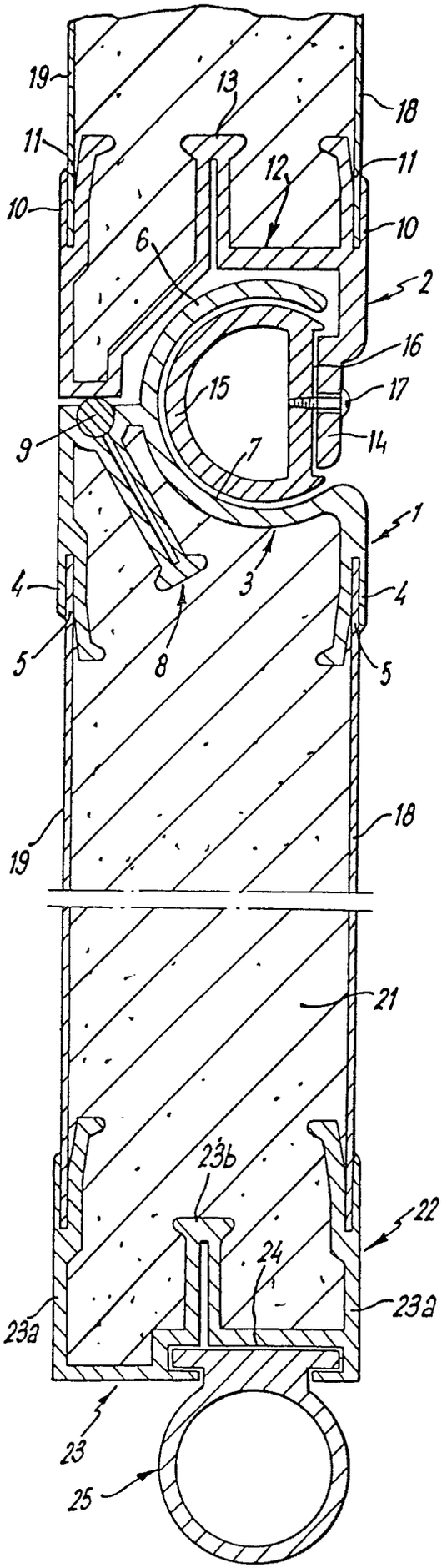
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FIG.1

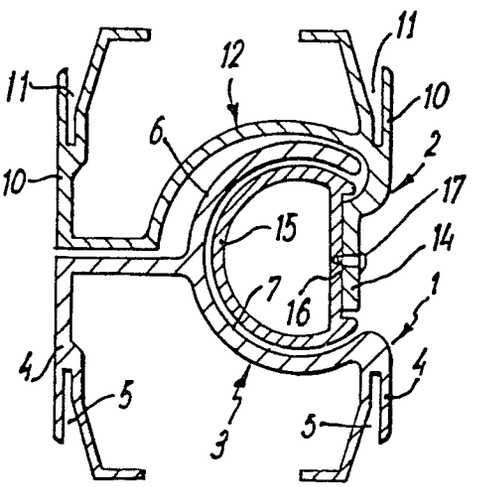
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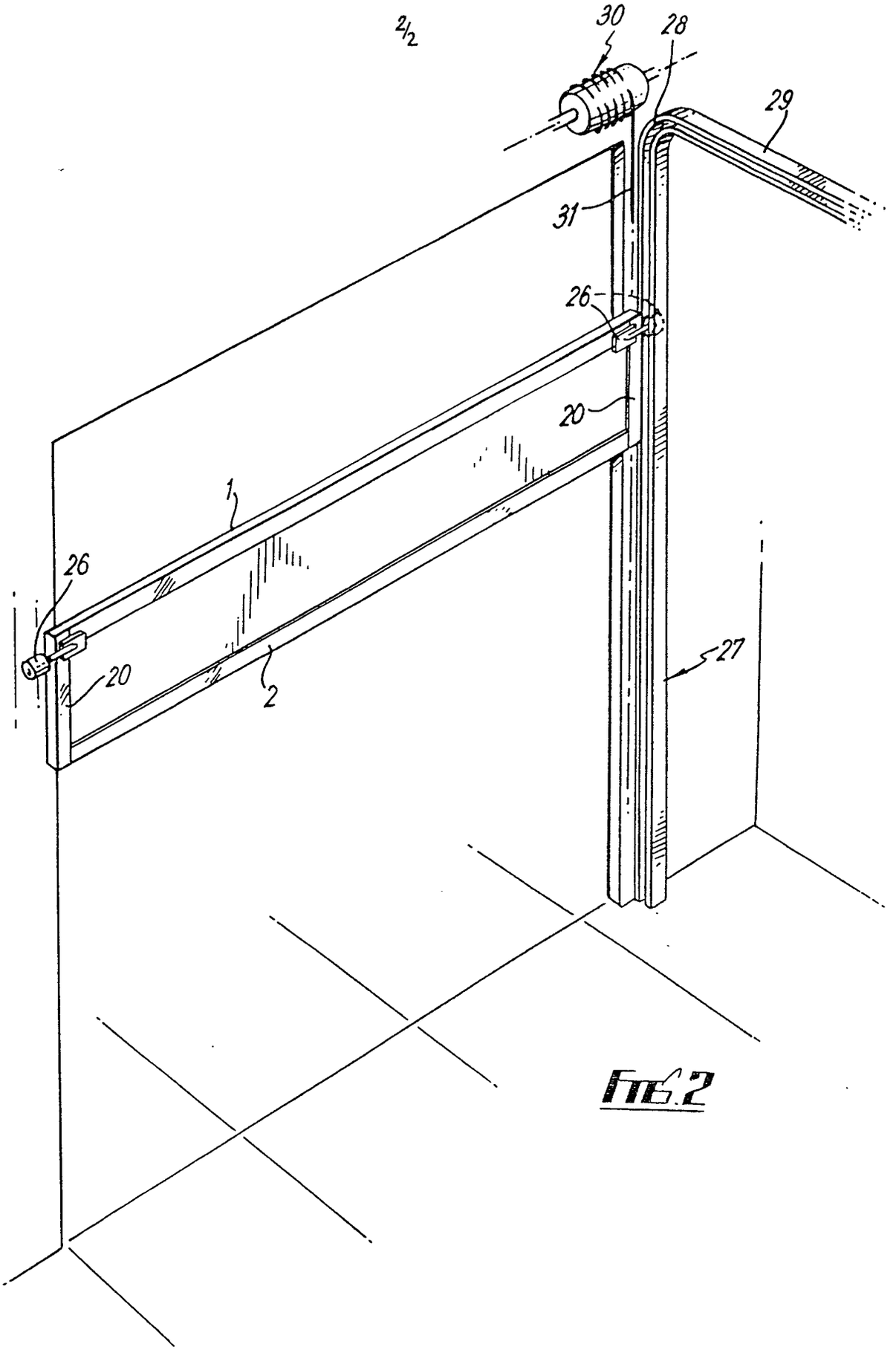
FIG.3



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EUROPEAN SEARCH REPORT

Application number
EP 80 30 4305

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 2 968 829 (MEDDICK) * Page 1, column 2, lines 41-72; page 2, column 3, lines 1-39; figures 3 and 6 * ---	1-5
X	GB - A - 1 080 331 (INGENIORFIRMAET FERNHOLT-GIERTSEN) * Page 2, lines 50-127; figures 1 and 2 * ---	1,2,5, 6
X	US - A - 3 511 301 (GRAHAM) * Column 2, lines 25-30, 41-70; figures 4 and 5 * ---------	1,2,5, 8,9

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

E 05 D 15/24
E 05 D 1/04

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

E 05 D

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	02.07.1981	NEYS