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

(11) Publication number: **0 199 560**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **86302919.5**

(22) Date of filing: **18.04.86**

(51) Int. Cl.⁴: **E 04 F 15/024**

(30) Priority: **18.04.85 GB 8509954**
25.07.85 GB 8518865

(43) Date of publication of application:
29.10.86 Bulletin 86/44

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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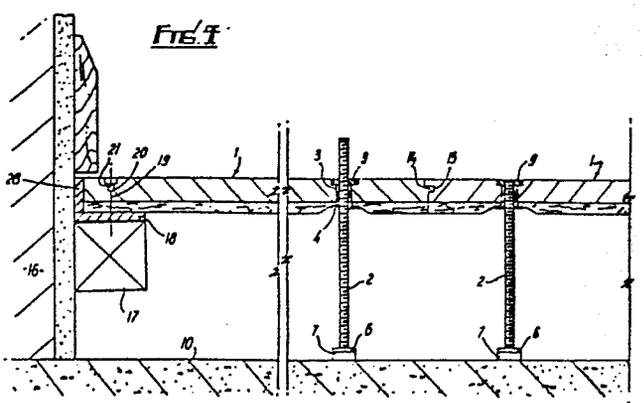
(54) **Floor panel assembly.**

(57) There is described a panel assembly for use in making a floor. The assembly comprises a plane or panel member having a number of length adjustable supporting members passing through and lockably mounted in the panel. The supporting members allow the panel to be fitted to a supporting surface in an adjustable manner.

The supporting members are mounted within the panel in a resilient manner thus to absorb vibrations.

There is also described a method of laying floor panels and also a laminate panel for use in making up the panel assembly. The laminate is in the form of a first lead foil sheet which is spaced from a second lead sheet by a core member.



EP 0 199 560 A2

"Floor Panel Assembly"

This invention relates to a floor panel assembly.

In modern buildings floor panels are mounted above the structural substrate which is usually a concrete floor. The substrate can be uneven and may be stepped or cambered, depending on the floor construction.

The floor panels, which are often provided with tongue and groove interlocking edges, are normally nailed to timber battens which lie on the concrete floor surface. The battens support the panels and help to hold them together. When it is desired to provide additional sound insulation for the floor structure a 'quilt' of glass or rock wool is positioned between the battens and the concrete floor.

The floor assembly then forms a raft which is isolated and free to 'float' over the substrate. This adds to the flexibility of the floor structure and thus increases the resistance to the transmission of impact sounds, such as footsteps, through the floor.

The levelling of this type of floor is achieved by placing wedges or packers beneath the battens to compensate for

depressions and cambers which are normally present in concrete and beam and pot floors.

With the introduction and enforcement by Building Control Authorities of higher standards of sound insulation between floors disadvantages have been found in this method of floor panel fitting.

The load supported by the floor is concentrated on the battens which tend to compress the glass or rockwool quilt. The load is further concentrated by the use of levelling wedges or packers resulting in all the useful resilience of the quilt being lost.

In these conditions the floor may fail to float or meet the insulation requirements.

Also, when fitted, the panels conceal the battens and the quilt. This makes visual inspection of the floor assembly very difficult and poor workmanship and fitting may go undetected until the floor is tested for its sound insulating properties.

In situations where a large degree of floor sound insulation is required the floor may be formed from a number of small panels supported at each corner by adjustable jacks, each jack supporting the corners of four adjacent panels. As the jacks are free standing on the substrate great care must be taken to ensure that the jacks are correctly positioned and at the correct height so as to produce a level and stable floor surface.

It is an object of the present invention to obviate or mitigate disadvantages of the systems described above.

According to the present invention there is provided a floor panel assembly comprising a panel member and a plurality of length adjustable elongate supporting members which pass through and are lockably mounted in the panel, the arrangement being such that one end portion of each of the supporting members bears against a lower supporting surface, the other end protruding through the panel to allow length adjustment to be affected, the panel being spaced from the lower surface by the supporting members.

The lower supporting surface may be a structural substrate in the form of a concrete floor of a building.

Preferably, the supporting members are in the form of threaded steel rods and are mounted in threaded sockets located in bores in the panel.

Preferably also, locking nuts are provided and are used to lock the supporting member in the desired position in the panel.

Preferably, also the ends of the supporting members which bear on the lower supporting surface are provided with resilient pads to help minimise sound transmittion from the panel to the surface.

Preferably also, when an excessive load is applied on a supporting member any load above the plastic limit of the resilient pad is supported by the supporting member.

Preferably also, the panel is made of flooring grade chipboard. A felt layer may be provided on the lower surface of the panel to enhance the sound absorption properties of the assembly. Also, lead foil may be provided between the panel and the felt layer to further enhance these

properties.

Further according to the present invention there is provided floor panel fixing means comprising a horizontal support member which extends along and is fixed to a structural member of a building, a floor panel supported at an edge portion by the support member, a resilient layer of material being positioned between the support member and the edge portion of the floor panel and an elongate fixing member which extends through a bore in the floor panel into the support member, a resilient ferrule being positioned in the bore between the fixing member and the panel.

Still further according to the present invention there is provided partition fixing means comprising a support member fixed to a substrate, a partition frame member separated from the support member by a resilient layer of material and an elongate fixing member passing through a bore in the lower partition frame member and a bore in the resilient layer into the support member, a resilient ferrule being positioned in the bore between the fixing member and the partition frame member.

Yet further according to the present invention there is provided a method of laying floor panels comprising positioning a rectangular floor panel above and spaced apart from a lower supporting surface, levelling the panel using four length adjustable elongate supporting members which pass through and extend from the panel, such supporting members being situated at each corner portion of the panel, positioning further supporting members provided in the panel and spaced apart from the corner supporting members such that all supporting members are in contact with the lower surface and locking all said supporting members in position.

There is also described a second aspect of the invention which relates to a sound insulation laminate for use in a floor, wall or ceiling panel.

Inadequate sound insulation between dwellings can lead to discomfort and inconvenience and can significantly lower the quality of life enjoyed by the occupants of such dwellings.

Additionally, improvements in sound detection instruments now permit local authorities to enforce Building Regulations relating to sound insulation. Many new and modernised dwellings are failing to meet the standards of sound insulation required by the Regulations and require extensive, and expensive, modifications before they are approved.

An object of the second aspect of the invention is to provide effective and easily fitted sound insulation.

According to the second aspect of the present invention there is provided a sound insulation laminate having a first lead foil sheet spaced from a second lead foil sheet by a core member.

Preferably, the foil sheets have weights of between 4 and 6 oz/sq.ft.

Preferably, a felt sheet is provided on the second lead foil sheet. This provides resilience when the laminate is used as a floor panel or sound absorption when the laminate is used as a ceiling or wall panel.

Preferably also, the core member is a chipboard panel to add mass to the laminate and hence improve its sound insulation properties. The chipboard also provides the laminate with

structural rigidity and strength.

Preferably also, the laminate is produced in the form of inter-fitting panels.

Further according to the second aspect of the present invention there is provided a sound insulation laminate having a lead foil sheet positioned between a first and a second sheet member.

The first sheet member may be a sheet of felt and the second sheet member may be a sheet of chipboard or a sheet of felt.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a sectional side view of part of a floor panel assembly in accordance with the present invention;
Fig. 2 is a perspective view of a locking nut of the floor panel assembly of Fig. 1;
Fig. 3 is a perspective view of a threaded insert of the floor panel assembly of Fig. 1;
Fig. 4 is a sectional view of part of two adjacent floor panel assemblies and floor panel fixing means in accordance with two aspects of the present invention;
Fig. 5 is a perspective view of a ferrule of the panel fixing means of Fig. 4;
Fig. 6 is a plan view of a number of fitted floor panel assemblies in accordance with the present invention;
Fig. 7 is a sectional side view of partition fixing means in accordance with

a further aspect of the present invention.

Fig. 8 is a sectional side view of a first sound insulation laminate made in accordance with the second aspect of the present invention;

Fig. 9 is a sectional side view of a second sound insulation laminate made in accordance with the second aspect of the present invention;

Fig. 10 is a sectional side view of a third sound insulation laminate made in accordance with the second apect of the present invention;

Fig. 11 is a perspective view of sound insulation laminate of Figs. 8 to 10 being fitted as floor panels;

Fig. 12 is a perspective view of sound insulation laminate of Figs. 8 to 10 being fitted as ceiling panels; and

Fig. 13 is a perspective view of sound insulation laminate of Figs. 8 to 10 being fitted as wall panels.

Referring to Figs. 1 to 3, a floor panel assembly comprises a rectangular planar panel 1 and a supporting rod 2 which passes through a bore 3 in the panel 1.

The supporting rod 2 is threaded and co-operates with an internally threaded steel insert 4 which is located on the panel in the lower portion of the bore 3.

The insert 4 is in the form of tee nut and has four prongs 5 which extend into the panel 1 and secure the insert 4 in place.

The upper section of the bore 3 is countersunk at 8 to receive a retaining nut 9 which is screwed onto the rod 2 to lock the rod 2 in a desired position.

At the lower end portion of the rod 2 there is provided a nut 6 which is locked in position by glue or other suitable substance.

An annular rubber pad 7 is affixed to the lower surface of the nut 6 and extends beyond the end of the rod 2 to contact a lower substrate 10 on which the panel assembly rests.

The panel 1 is in the form of a laminate of flooring grade chipboard 11, lead foil 12 and felt 13 to provide a high degree of sound insulation.

As is best seen in Figs. 4 to 6, floor panels 1 to be installed are delivered to the site counterbored and with the inserts 4 fitted. The rods 2 are screwed into the inserts 4 on site.

When a panel 1 is to be laid on a substrate 10 such as a concrete floor, the rods 2A, 2B, 2C and 2D at the corners of the panel 1 are first adjusted to level the panel 1 at the desired height above the substrate 10. The length of rod 2 extending from the panel 1 being adjusted by turning the rod 2 in the insert 4.

Once the panel 1 has been levelled the remaining rods 2E are screwed down until they are in contact with the substrate 10 and are finger tight. The retaining nuts 9 are then screwed down to lock the rods 2 in position. The nuts 9 tighten into the counterbored recess in the bore 3 and are flush with the upper surface of the panel 1.

Any excess length of rod 2 protruding from the upper surface of the panel 1 is snipped off with bolt croppers flush with the retaining nut 9.

Tongues 14 and grooves 15 are provided on the adjacent respective edges of the panels 1 to provide a secure fit between adjacent panels 1.

Under the dead load of an assembled floor, as is shown in Fig. 6, the resilient pads 7, which are 6mm thick in this example, are designed to compress approximately 1mm. A further imposed load of 25kg causes a further compression of 1mm and a total imposed load of 50kg results in a total compression of 3mm which still provides the required resilience to meet impact sound insulation standards.

The resilient pad 7 is designed such that upon the imposition of excessive concentrated load on individual rods 2, the resilient pad 7 is not compressed beyond the range of elastic recovery. Before this compression is reached, the end of the rod 2 bears directly on to the substrate 10 thus protecting the pad 7 which can recover its original profile when the excessive load is removed.

When a floor of this type is fitted it is essential that the floor "raft" does not contact the enclosing walls 16 of the floor, otherwise much sound insulation would be lost. To prevent this a gap of 5-6mm is left between the periphery of the floor raft and the walls 16.

However, over a period of time the floor raft tends to migrate to close this gap against one or possibly two walls. This migration is caused by ordinary vibration, foot traffic and building movement.

The gap may be sealed with a resilient sealant which is effective in the short term but may lose its effectiveness through embrittlement or may even be squeezed out of the gap.

Fig. 4 shows floor panel fixing means which comprise a horizontal levelling batten 17 which extends along a supporting wall 16, a floor panel 1 supported at an edge portion by the batten 17, a resilient pad 18 being positioned between the batten 17 and the floor panel 1 and a fixing nail 19 which extends through a bore 20 in the floor panel 1 into the batten 17, a resilient ferrule 21 being positioned in the bore between the nail 19 and the panel 1.

A layer of resilient material 28 is also provided between the outer edge of the panel 1 and the wall 16.

The ferrule 21 acts effectively to isolate the fixing nail 19 from the floor raft, thereby obviating sound transmission between the nail 19 and the floor raft.

When the floor is fixed to the supporting wall 16 in this manner migration of the floor raft is substantially restricted.

When a concrete floored room is to be provided with partitions it is desirable that the partitions are supported by the concrete floor rather than by the floating floor.

However, if the partitions were rigidly fixed to the concrete floor sound waves from the concrete floor would be radiated from the partition and by-pass the floor insulation.

Referring now to Fig. 7, partitioning fixing means comprise

a batten 22 nailed to the concrete floor 10 and separated from a batten 23 of a partition 29 by a layer of felt 24. A fixing nail 25 passes through a bore 26 in the partition batten 23 into the batten 22 on the floor 10, a resilient ferrule 27 being positioned in the bore 26 between the nail 25 and the partition batten 23.

The partition 29 is similarly fixed at its top portion to the ceiling.

By mounting the partition the batten 23 on the felt 24 and isolating the nail 25 in a resilient ferrule 27 the partition 29 is effectively acoustically isolated from the rigid floor 10 and ceiling.

Referring to Fig. 8, a sound insulation laminate, shown generally at 51, comprises a first lead foil sheet 52, a chipboard panel 53, a second lead foil sheet 54 and a felt sheet 55.

The chipboard panel 53 is provided with tongues 151 and grooves 152 to facilitate accurate and secure fitting to adjacent panels. Woodwork glue may also be used to provide a seal between adjacent tongues 151 and grooves 152.

The two lead foil sheets 52 and 54 are thin lead foil sheets of, for example, 4 and 6 oz/sq.ft. This arrangement provides greater resistance to the transmission of sound than a laminate having a single lead foil of equivalent or greater weight, for example, 18 oz/sq.ft. Other combinations of lead foil, for example two sheets of 6 oz/sq.ft., or a sheet of 6 oz/sq.ft and a sheet of 9 oz/sq.ft., may be used.

The chipboard panel 53 adds mass to the laminate 51, and, as

mass is generally proportional to sound insulation properties, provides additional sound insulation. Also, the chipboard panel 53 provides the laminate with structural strength making fitting of the laminate convenient and economical.

The felt sheet 55, which may be made from jute or hair, provides the laminate 51 with resilience when it is used as a floor panel and additional sound absorption properties when the laminate 1 is employed as a ceiling or wall panel.

The outer surface of the first lead foil sheet 52 is covered by a paper sheet to prevent children or animals from gaining access to the lead.

Fig. 2 shows a laminate similar to the laminate of Fig. 1 but without the first lead foil sheet 52. In this example, a hessian textile laminate 56 is applied to the chipboard panel 3. The hessian 56 is primed ready for painting to provide an attractive exterior finish.

The laminates of Figs. 8 and 9 may be fitted as floor, wall or ceiling panels 60, 61 and 62, as shown in Figs. 11, 12 and 13 respectively.

Fig. 10 shows a laminate for floor sound insulation having a lead foil sheet 57 sandwiched between two layers of felt 58 and 59. The upper layer 58 is of jute and hair and the lower layer 59 is of acrylic material.

In use, the laminate is located on the existing floorboards and below chipboard panels. The laminate is supplied in broad strips and when fitted the edges of adjacent strips are joined by sealing tape.

Thus, the sound insulation laminate of the present invention provides an effective and easily fitted solution to the problem of inadequate sound insulation. The use of two thin lead foil sheets, as opposed to one thicker sheet, provides better sound insulation with less expense and weight.

Modifications and improvements may be incorporated without departing from the scope of the invention.

CLAIMS

1. A panel assembly comprising a panel member and a plurality of length adjustable elongate supporting members which pass through and are lockably mounted in the panel, the arrangement being such that one end portion of each of the supporting members bears against a lower supporting surface, the other end protruding through the panel to allow length adjustment to be affected, the panel being spaced from the lower surface by the supporting members.

2. A panel assembly as claimed in Claim 1, wherein the supporting members are in the form of threaded steel rods and are mounted in threaded sockets located in bores in the panel.

3. A panel assembly as claimed in Claim 2, wherein locking nuts are provided and are used to lock the supporting member in the desired position in the panel.

4. A panel assembly as claimed in any preceding Claim, wherein the ends of the supporting members which bear on the lower supporting surface are provided with resilient pads to help minimise sound transmittion from the panel to the surface.

5. Panel fixing means comprising a horizontal support member which extends along and is fixed to a structural member of a building, a floor panel supported at an edge portion by the support member, a resilient layer of material being positioned between the support member and the edge portion of the floor panel and an elongate fixing member which extends through a bore in the floor panel into the support member, a resilient ferrule being positioned in the bore between the fixing member and the panel.

6. Partition fixing means comprising a support member fixed to a substrate, a partition frame member separated from the support member by a resilient layer of material and an elongate fixing member passing through a bore in the lower partition frame member and a bore in the resilient layer into the support member, a resilient ferrule being positioned in the bore between the fixing member and the partition frame member.

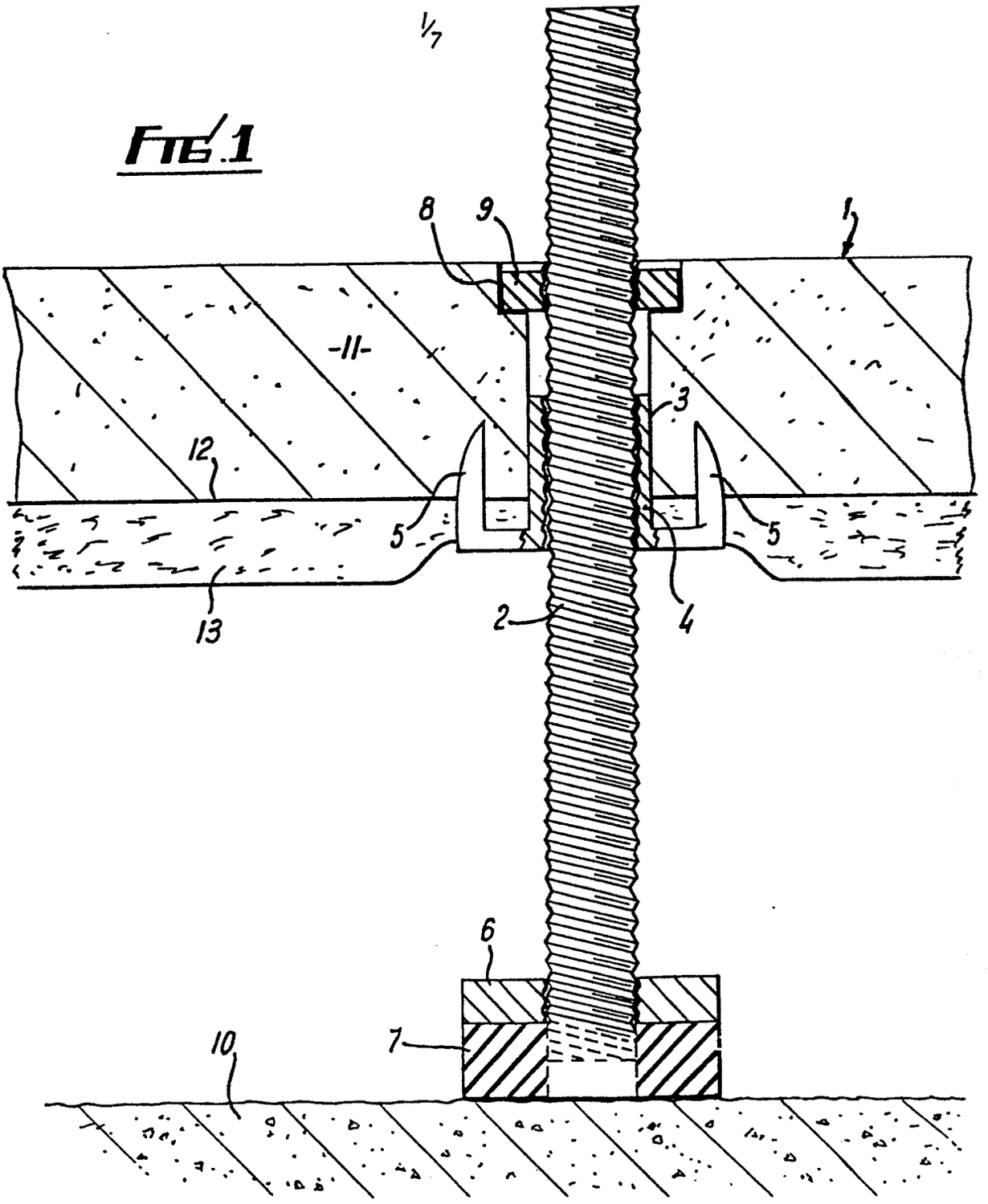
7. A sound insulation laminate having a first lead foil sheet spaced from a second lead foil sheet by a core member.

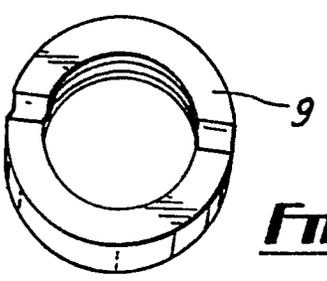
8. A laminate as claimed in Claim 7, wherein the foil sheets have weights of between 4 and 6 oz/sq.ft.

9. A sound insulation laminate having a lead foil sheet positioned between a first and a second sheet member.

10. A laminate as claimed in Claim 8, wherein the first sheet member is a sheet of felt and the second sheet member is a sheet of chipboard or a sheet of felt.

ФИГ.1





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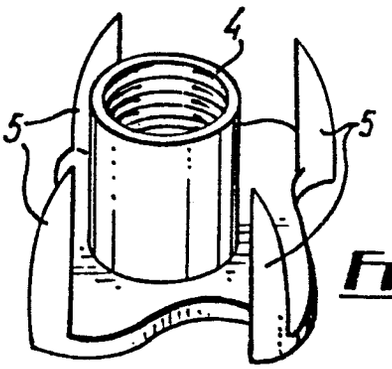

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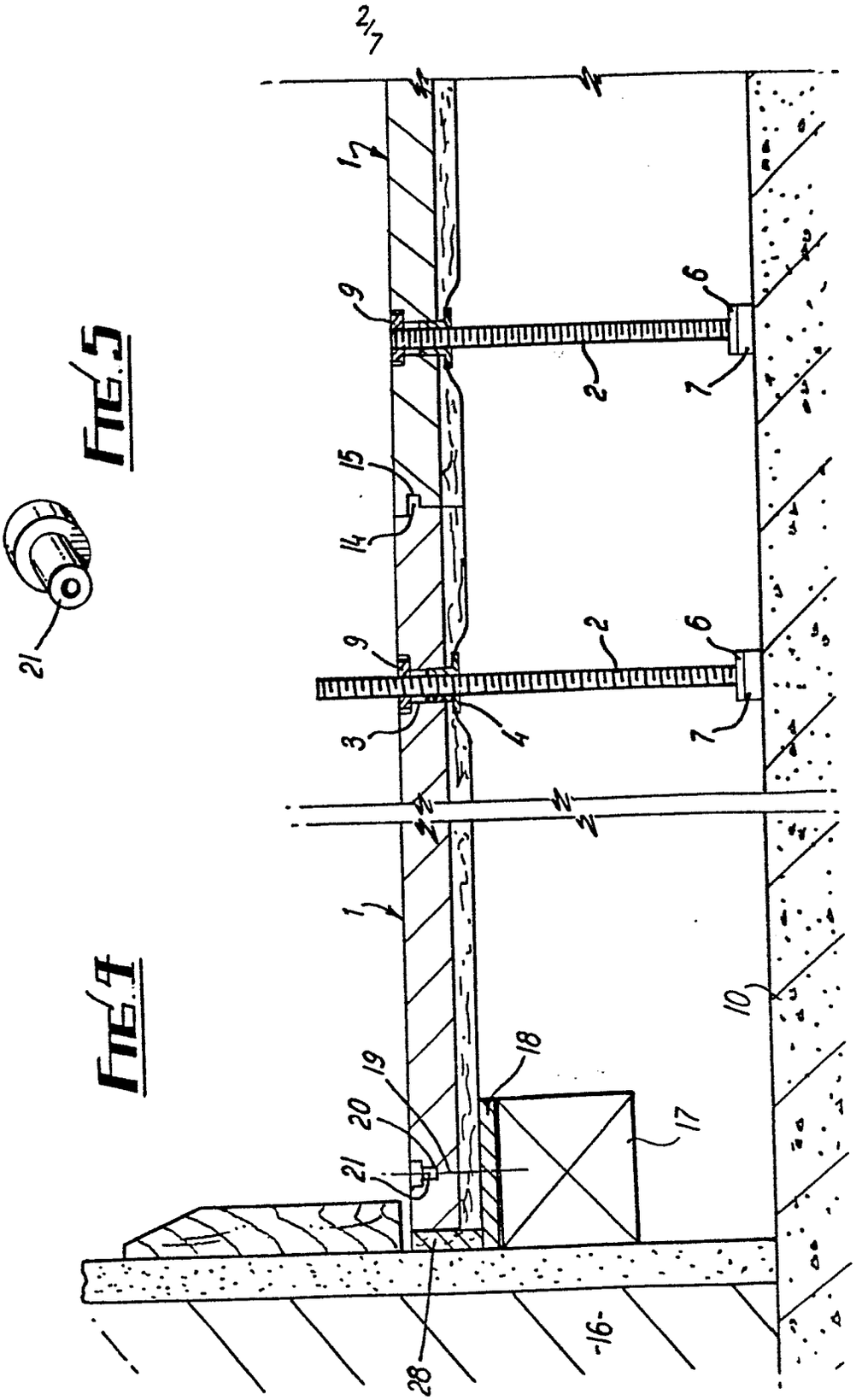


FIG.4

FIG.5

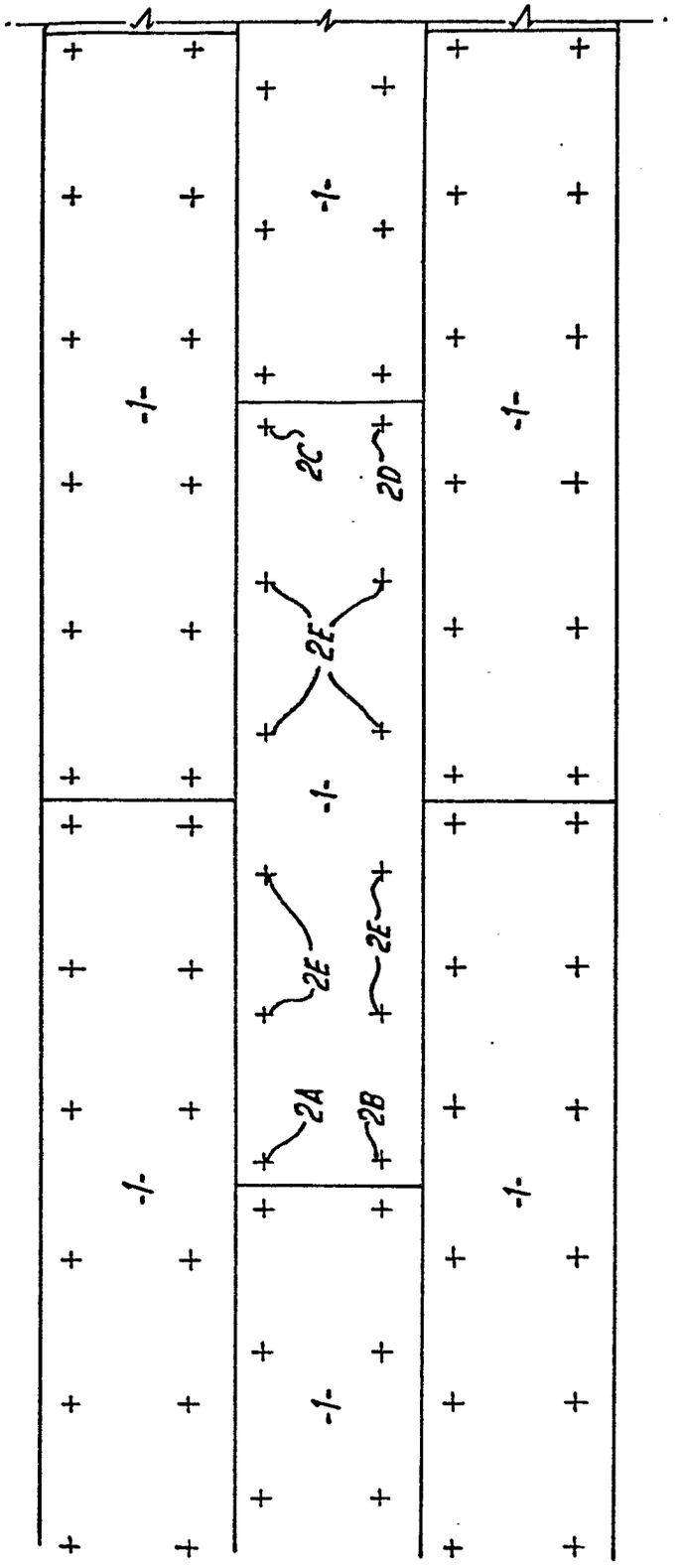


FIG. 6

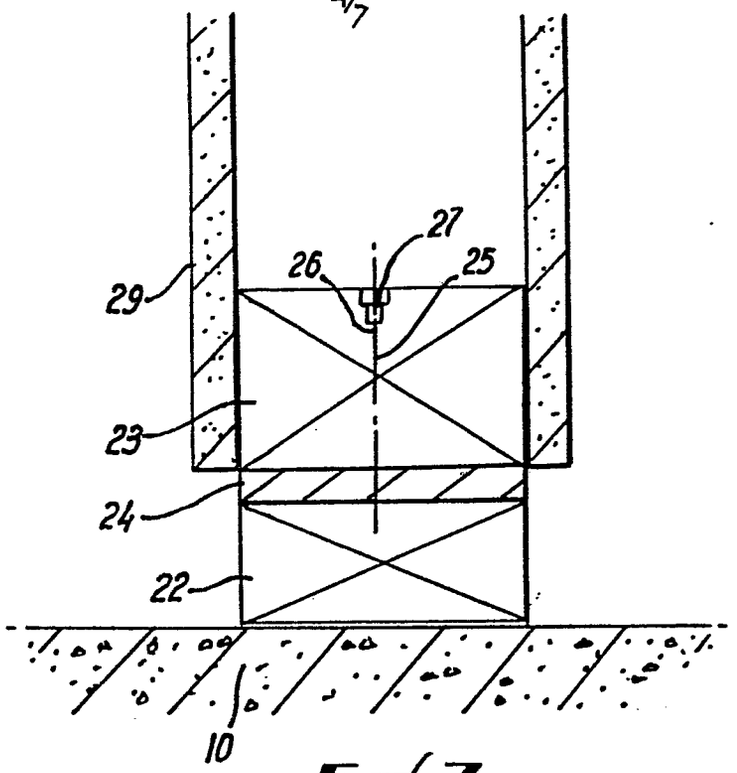


FIG.7

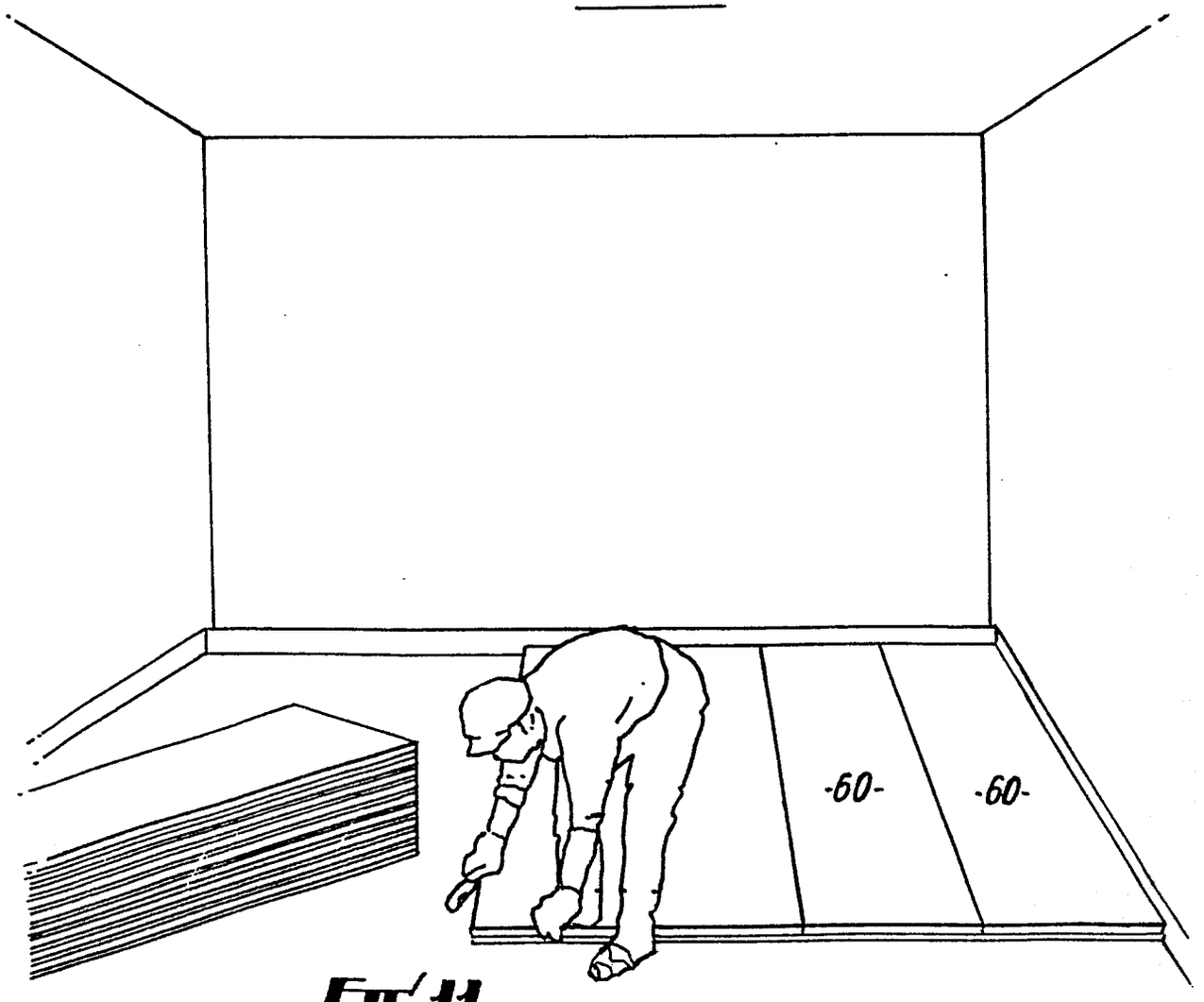
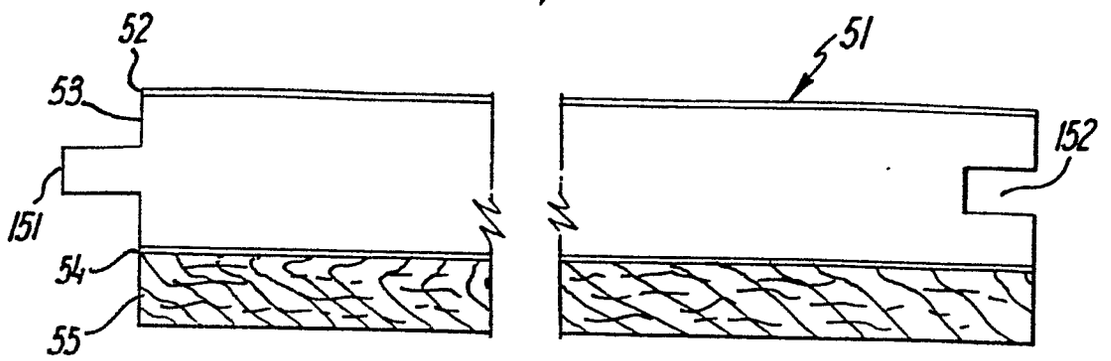


FIG.11



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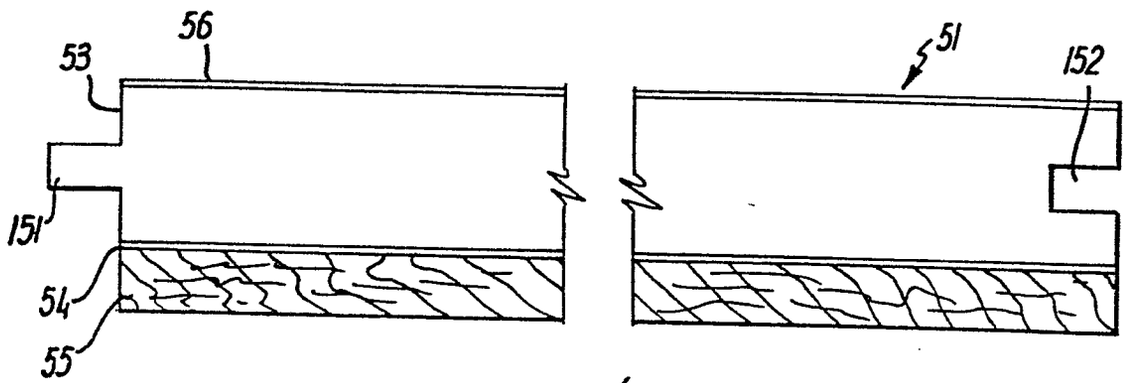

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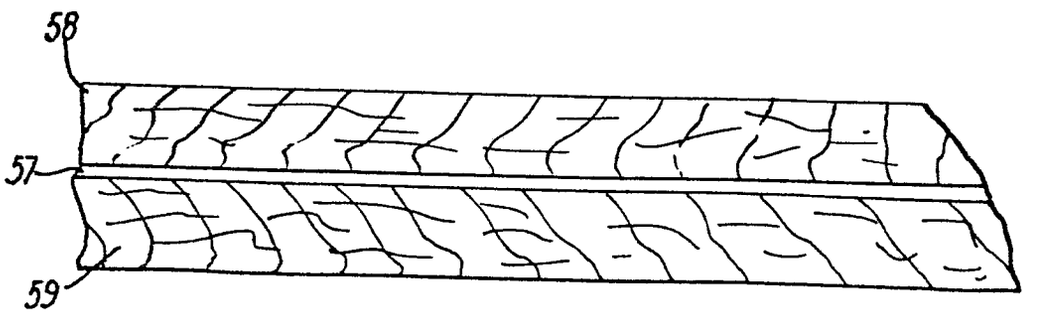

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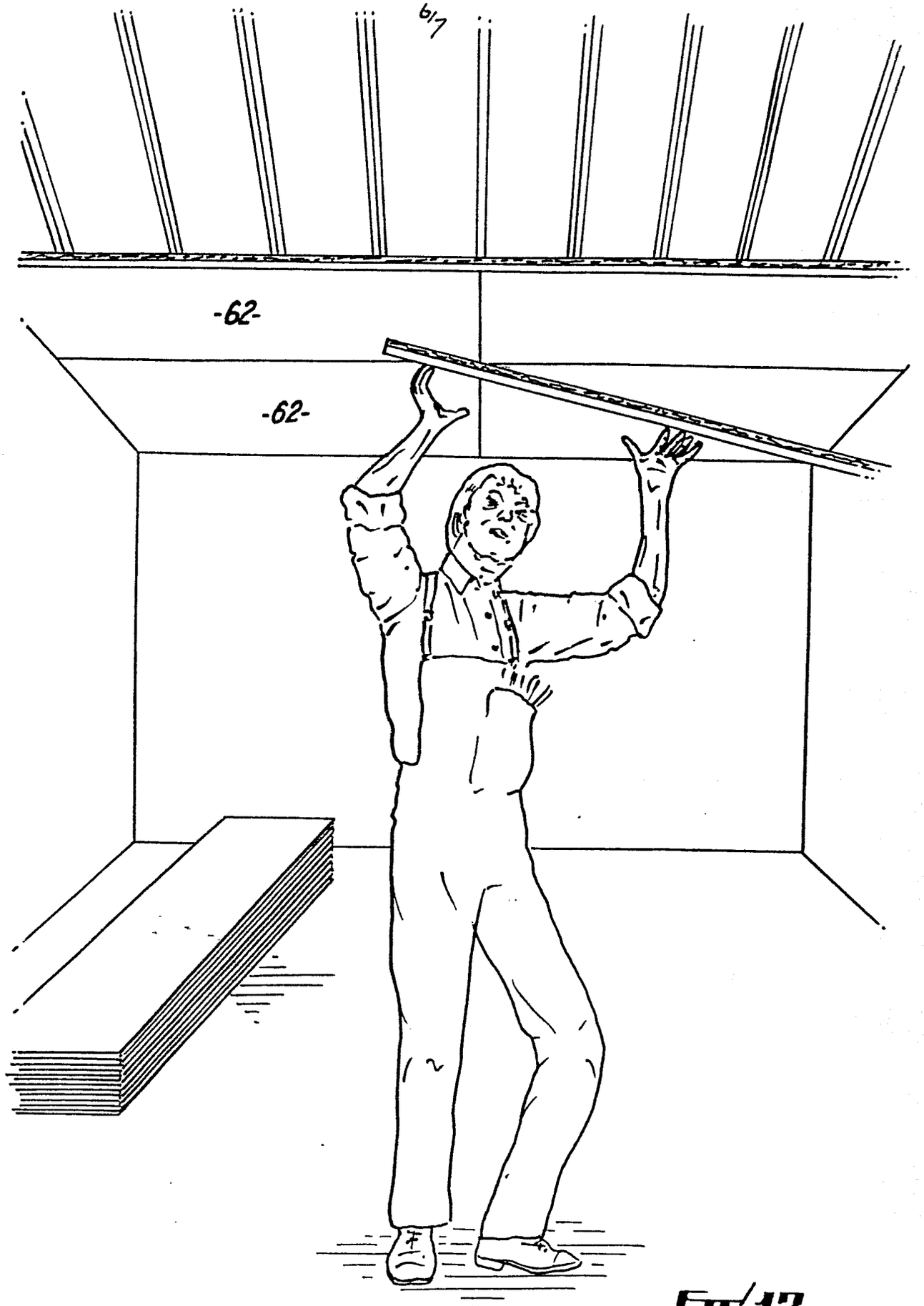
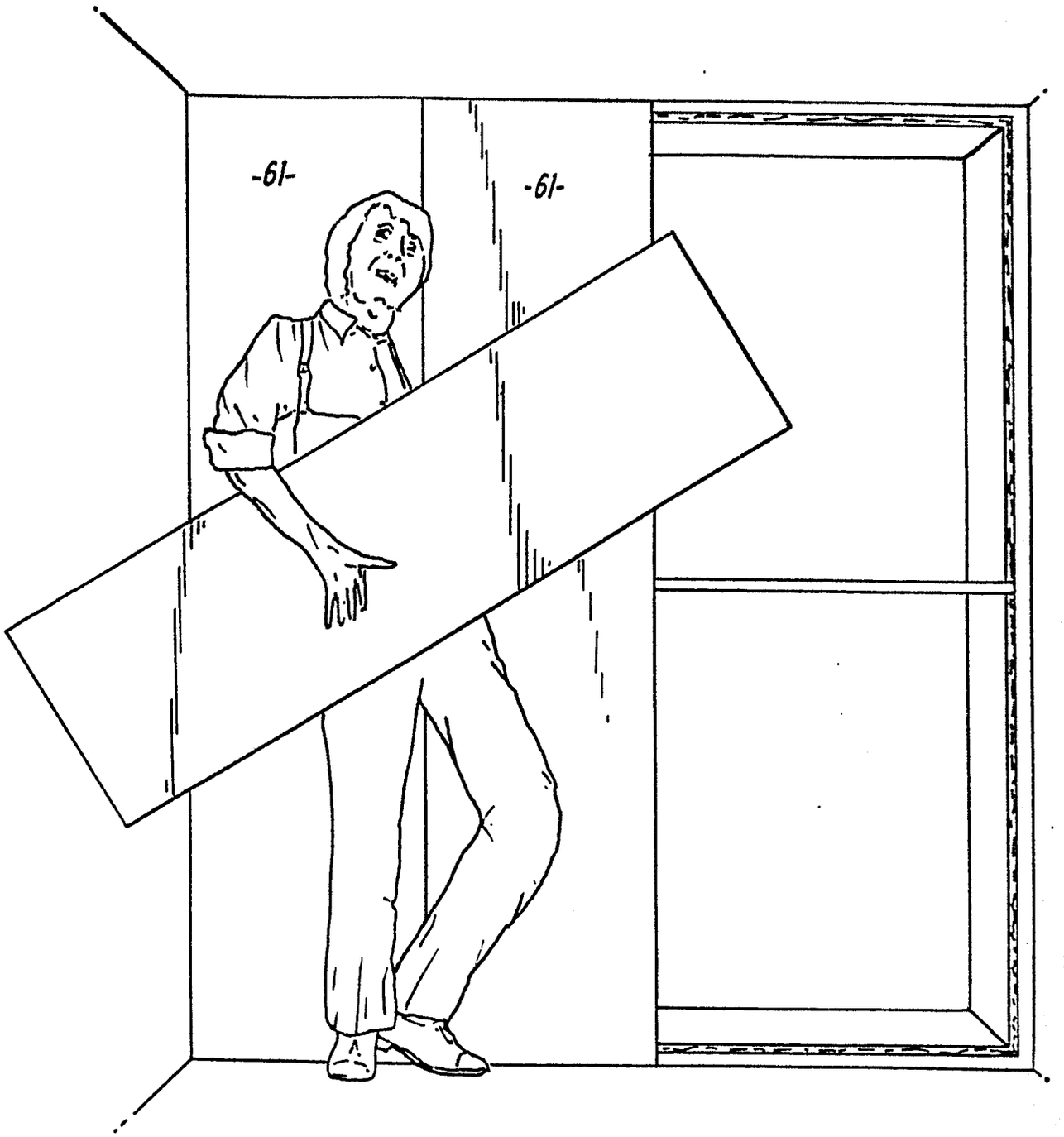


FIG.12



ФИГ.13