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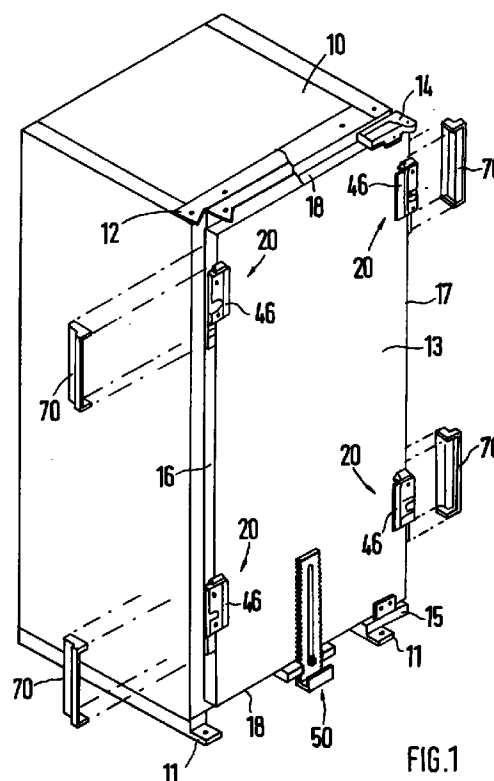
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(54) **Method and device for attaching a door leaf to appliance door of a built-in domestic appliance**

(57) A method and a device for applying a door leaf (60) to the appliance door (13) of a built-in domestic appliance incorporated in a cabinet, such as a refrigerator, freezer, dishwasher and the like, in which there are attached to the appliance door (13) in the region of mutually opposed sides adjustment fittings (20), which are connected both to the appliance door (13) and to the door leaf (60), and permit alignment of the door leaf (60) on the appliance door (13) in the vertical and lateral directions, and in depth.



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Description

The invention relates to a method and to a device for attaching a door leaf to the appliance door of a built-in domestic appliance incorporated in a furniture cabinet, such as a refrigerator, deep freeze, dishwasher and the like, in which adjustment fittings are applied to the door release in the region of mutually opposed sides, said adjustment fittings being connected both to the appliance door and also to the door leaf, permitting alignment of the door leaf on the appliance door in the vertical and lateral directions and in depth.

Such a method and device for carrying out the method are known from EP 0 168 672 B1. In this known method, assembly is difficult, and it is necessary in advance at the factory to locate attachment points on the appliance door by means of a stencil, dimensional estimation, or pre-drilling.

The document DE-A 31 35 788 describes an attachment device for adjustable front panels of a drawer, in which attachment devices are provided for both sides of the drawer, which include a retaining part attached to the front panel and a support part attached to the drawer. The retaining part is pushed directly from underneath into the support part and suspended thereon at the top by means of an adjustment screw. There is provided between these two mounting points a fixing screw by means of which the retaining part is locked on the support part.

The document DE-A 29 22 384 involves attachment and vertical, lateral and depth adjustment of a door leaf in front of an appliance door of domestic built-in appliances. According to this proposal, there is used for attaching the door leaf to the upper side of the appliance door a large angular fitting which extends over almost the entire width of the door. After assembly of this fitting, circulation and escape of air between the door leaf and the appliance door are prevented. Thus condensation, water or moist air can form in the interspace between door leaf and appliance door, which at length can lead to distortion or warping of the door leaf, which is usually constructed of wood. It is in fact possible with this known construction to undertake attachment and vertical and depth adjustment without having to offset the door leaf from the appliance door, yet lateral adjustment of the door leaf relative to the appliance door is not possible. For this purpose the door leaf must be taken off, thus preventing rapid and simple assembly. The assembly must be effected with the aid of a pattern or dimensional assessment, in order to mark the attachment holes provided for the fittings on the door leaf.

A further drawback of the known construction is that, when undertaking lateral and vertical adjustment, the depth adjustment may respectively change. Finally, there is only a positive-locking connection between appliance door and door leaf. In the opening direction, i.e. in the traction direction of the refrigerator door, over a period there may be an involuntary displacement of the door leaf and thus of the flush adaptation to the surrounding

cabinet fronts, when the assembled screws become loose after a time.

It is the purpose of the invention to provide a method and a device for carrying out this method, in which the door leaf may be connected in a simple way to the appliance door of a built-in domestic appliance rigidly incorporated already in the cabinet, without previous location of attachment points, whether with the aid of patterns, or by measurement or by drilling at the furniture factory, this assembly being capable of being effected by one man.

The purpose of the invention is fulfilled in a method already mentioned, in that there is already initially attached to the appliance door, or mounted before incorporation of the domestic appliance in the cabinet, on at least two mutually opposed front sides of the appliance door, a respective adjustment fitting, the door leaf overlapping the appliance door on all sides by at least the constructive height of the adjustment fitting in the plane of the appliance door, plus the desired contact width of the door leaf on the cabinet carcass, at least one vertically adjustable support element being attached to the lower side of the appliance door which, after incorporation of the built-in domestic appliance in the cabinet, is adjusted to the desired height of the lower edge of the door leaf, in that, when the appliance door is closed, the door leaf is located with its lower edge on the support element and, being laterally aligned, is pressed against the appliance door and is held in an initial manner by means of adhesive layers of the adjustment fittings on the appliance door, in that thereafter, when the appliance door, temporarily connected to the door leaf, is opened, the adjustment fittings are rigidly connected in the region of their parts projecting over the appliance door to the rear side of the door leaf, and in that, when the support element is removed, the door leaf is aligned vertically, laterally and in depth, and is secured after alignment by means of the adjustment fittings.

By means of the application of the adjustment fittings to the front sides of the appliance door, it is possible then to connect the initially attached door leaf by means of screws in a secure manner to the adjustment fittings. Thus no attachment points need previously be located on the rear side of the door leaf. Small fluctuations during initial application of the door leaf have no influence on its alignment. By means of the preliminary attachment of the door leaf with the aid of the adhesive connection, assembly is simplified in such a way that it may be carried out by one man without difficulty. The adjustment fittings on the support element can thus be attached at the factory, so that assembly on site is further simplified.

A design which has proved advantageous is characterised in that two adjustment fittings are respectively attached to the vertically-aligned front sides of the appliance door, and are located in the end regions facing the lower and upper edges of the appliance door.

In order that the adhesive connection between the door leaf and the appliance door holds securely when both the latter are opened, according to one design the adjustment fittings are adjusted before attachment of the

door leaf at a spacing from the appliance door in such a way that, when the appliance door is closed, the initially attached door leaf does not contact the cabinet carcass. This in addition ensures that when the door leaf is pressed on, the adhesive connection is effectively produced.

If in this case this spacing is observed by means of securing parts inserted in the adjustment fittings which, after rigid connection to the door leaf, are removed from the adjustment fittings, then in the initial condition of the adjustment fittings, the necessary spacing is clearly predetermined. If the door leaf is connected to the adjustment fittings, then this spacing may be altered. The door leaf is no longer capable of releasing itself from the adjustment fittings.

The adjusted and secured adjustment fittings are covered by means of cover caps, in order to obtain an optically pleasing closure for said adjustment fittings.

A device for carrying out the method is characterised in that a releasable guide plate is attached to the lower front side of the appliance door, for an angle bracket as a support element, in that the angle bracket has a vertical slot for a fixing screw of the guide plate, in that the adjustment fittings have a base portion connectable to the front side of the appliance door, and which is adjustable (vertical adjustment) by means of a set screw adjustable in a bearing part connectable to the front side, in that the adjustment fittings have a panel portion connectable to the rear side of the door leaf, which is provided on the side facing the rear side of the door leaf with an adhesive layer covered with a removable protective layer, and which has a U-shaped receiving means, aligned vertically to the longitudinal direction of the base portion, for a fixing screw, which is screwed into a threaded hole of a depth adjustment portion located between the base portion and a panel portion, and in that the depth adjustment portion is adjustably guided in the base portion transversely to the longitudinal direction of the same, and carries a depth adjustment screw which is adjustable in a threaded hole in the base portion.

When the door leaf is rigidly connected to the appliance door, then the support element may be removed from the appliance door, as it has fulfilled its function during assembly. The base portion and the bearing portion of the adjustment fittings and the panel portions are previously attached to the appliance door. The panel portion is only connected to the door leaf upon assembly of said door leaf, this being previously carried out by means of the adhesive connection and later by the rigid connection, e.g. screws. In order to permit vertical adjustment of the door leaf, the base portion is provided with elongate holes for securing screws serving as fixing screws for the vertical direction, the elongate holes being aligned in the longitudinal direction of the front side of the appliance door.

In order to provide depth adjustment and locking via the depth adjustment portion, said depth adjustment portion has a guidance fitting, which is adjustably guided in a guidance receiving means aligned transversely to the

longitudinal direction of the base portion, and may be locked in the adjusted position by means of a fixing screw.

The initial condition of the adjustment fittings is secured according to one design in that there is inserted between the base portion and the depth adjustment portion, or between the depth adjustment portion and the panel portion a spacer portion, which in the initial condition of the adjustment fitting determines a predetermined distance between door leaf and appliance door.

If the depth adjustment portion has a threaded receiving means for a securing screw, which is passed through the receiving means in the panel portion, and is secured with a head on the rear side of the door leaf, then the depth adjustment may be locked, the lateral adjustment being simultaneously secured.

Improved locking of the depth adjustment is achieved in that the fixing screw is passed through an elongate hole in the fitting of the depth adjustment portion, and is screwed into a threaded hole in the base portion.

Renewed removal of the door leaf without loosening the depth and vertical adjustment and without loosening the adjustment fittings is achieved in that the depth adjustment portion is provided with a locking projection, which vertically positions the panel portion in the tightened condition, and releases it on all sides in the loosened condition.

The invention will now be explained in more detail with reference to an embodiment given by way of example and illustrated in the drawings, which show:

Figure 1: a perspective view of a built-in domestic appliance with adjustment fittings and a support element on the appliance door;

Figure 2: an enlarged perspective view of the support element on the lower edge of the appliance door;

Figure 3: the assembled position of the door leaf;

Figure 4: a diagrammatic view of the connection between the adjustment fitting and the door leaf, and

Figure 5: an exploded view of an adjustment fitting.

Figure 1 shows a built-in domestic appliance 10, as delivered to the assembly site. The appliance door 13 is articulated by hinges 14 and 15 to the chassis of the appliance. Attachment to the cabinet carcass is effected by the attachment lugs 11 of the attachment strip 12 attached at the top on the front side of the appliance chassis. Attached to the vertical front sides 16 and 17 of the appliance door 13 are respectively two adjustment fittings 20, which partially overlap the appliance door 13 on the front side, and carry an adhesive coating 46 covered with protective film. If the appliance door 13 is small,

then only one adjustment fitting 20 may be attached on each side of the appliance door 13, connected to an additional simple attachment part. It is also possible to attach the adjustment fittings 20 to the upper and lower front sides 18 of the appliance door 13. The adjustment fittings 30 may be concealed by cover caps 70.

Attached to the lower front side of the appliance door 13 is a support element 50, upon which the door leaf 60 to be attached may be located. As Figure 2 shows, the support element 50 is formed from a guide plate 51 and an angle bracket 55. The guide plate 51, provided with a slot 52, is secured by two screws 61 on the lower front side 18 of the appliance door 13, yet may be laterally withdrawn. In the angled portion 53 of the guide plate 51, the vertical leg of the angle bracket 55 is adjustable in a stepped manner relative to the elongate slot 56, as shown by the serrations 54 and 62. The set vertical position of the angle bracket 55 is secured by means of the fixing screw 59. The angle bracket 55 has a double fold at the lower end, as shown by portions 57 and 58, and forms a receiving means for adjusting the door leaf 60, as Figure 3 shows.

If the built-in domestic appliance 10 is incorporated rigidly in the cabinet, then assembly of the door leaf 60 is begun. The support member 50 is adjusted vertically so that the desired lower edge of the door leaf 60 is secured by the receiving means with the portions 57 and 58. The protective film is previously removed from the adhesive coatings 46 of the adjustment fittings 20, in which, by means of the inserted spacer portion 31, the panel portion 40 stands back from the base portion 24 to such a distance that the attached door leaf 60 does not contact the cabinet body when the appliance door 13 is closed.

The door leaf 60 is mounted on the portion 57 of the support element 50 without contact with the adhesive layers 46. The door leaf 60 is then held centrally to the opening in the cabinet and is aligned, and pressed firmly against the adjustment fittings 20. Thus the adhesive layers 46 ensure the initial connection between the door leaf 60 and the appliance door 13 via the adjustment fittings 20. As in the initial adjustment of the adjustment fittings 20, the door leaf does not come into contact with the cabinet body, this adhesive connection may be produced without impairment.

The appliance door 13 is carefully opened via the attached door leaf 60. The panel portions 40 of the adjustment fittings 20 are screwed tightly by means of the fixing screws 40 and 44 via the attachment bores 41 and 43 to the rear side of the door leaf 60, as Figure 4 shows. The support element 50 is removed from the appliance door 13 by lateral displacement or withdrawal. By enlargement of the spacing between the appliance door 13 and the door leaf 60, effected by the depth adjustment screw 37, the spacer portion 31 may be removed from the adjustment fitting 20. Alignment of the door leaf 60 vertically, laterally and in depth may now be undertaken.

The appliance door 13 with door leaf 60 is closed. In this condition the necessary vertical, lateral and depth displacement may be estimated. The appliance door 13 with the door leaf 60 is again opened, and then the fixing screws 26 and 28 and the fixing screws 47 and 48 are loosened. Vertical adjustment is initiated with the upper adjustment fittings 20. The attachment screws 26 and 28 are partially loosened, so that the base portion 24 may be adjusted via the slots 25 and 27 in the longitudinal direction of the front sides 16 or 17. Adjustment is ensured by the set screw 23 which is displaceable in the bearing portion 21. The bearing portion 21 is secured by screws 22 to the front side 16 or 17 of the appliance door 13. In this respect the appliance door 13 must be displaced bit by bit to the left and right, and note must be taken of the parallelism of the door leaf 60 with the cabinet carcass. The appliance door 13 with the door leaf 60 is again closed. The door leaf 60 is laterally adjusted, the fixing screws 47 being moved in the receiving means 45 of the panel portions 40. If the door leaf 60 is centrally aligned, then the appliance door 13 with door leaf 60 is again opened. By means of the fixing screws 26 and 27, the base portions 24 are secured in their vertical adjustment. This applies also to the lower adjustment fittings 20 which, in accordance with the setting of the upper adjustment fittings 20, are subsequently adjusted. By means of the fixing screw 47, the panel portion 40 is clamped against the depth adjustment portion 34 and thus the lateral adjustment of the door leaf 60 is secured. The fixing screw 47 is in this case adjustable in the threaded hole 38 in the depth adjustment portion 34. Thus the panel portion 40 abuts against the head of the depth adjustment screw 37.

Depth adjustment is effected via the depth adjustment screw 37 which, like the fixing screw 47, is accessible and may be rotated from the end facing the base portion 24. The depth adjustment screw 37 is adjustable in the threaded hole 29 in the base portion 24. The depth adjustment portion 34 has a projection 35, which is adjustably guided in a receiving means aligned transversely to the longitudinal direction of the base portion 24, and has an elongate hole 36 for the fixing screw 48, by means of which adjustment of the depth adjustment portion 34 is secured. Once the depth adjustment screw 37 has been brought into the desired position, then the appliance door 13 with the door leaf 60 is closed, and the depth adjustment is tested. If necessary, the appliance door 13 with door leaf 60 is again opened and re-adjusted. Once depth adjustment is complete, then the fixing screw 48 is screwed into the threaded receiving means 49, and the depth adjustment portion 34 is fixed in the set position.

The adjustment procedures described for lateral fixing and depth fixing are always to be undertaken on all adjustment fittings 20.

As Figure 5 shows, the base portion 24 has an aperture 30, through which access is provided to the fixing screw 44 and the fixing bore 43. The spacer portion 31 has an aperture 32 for the head of the fixing screw 40

and angularly surrounds the fitting block of the depth adjustment portion 34, as shown by reference numerals 33 and 63.

After vertical, lateral and depth adjustment on all adjustment fittings, and securing of the adjusted positions, the adjustment fittings 20 are concealed by cover hoods 70.

In order to dismantle the cabinet front 60 with the panel portions 40, the cover hoods 70 are removed and fixing screws 47 are loosened approximately 3 to 4 mm. In this way the cabinet front 60 may be lifted out entire, with the panel portions 40, through the intermediate spaces between the heads of the fixing screws 47 and the locking projections 68, in an upward direction, and off the appliance door 13.

Claims

1. Method for attaching a door leaf to the appliance door of a built-in domestic appliance incorporated in a furniture cabinet, such as a refrigerator, deep freeze, dishwasher and the like, in which adjustment fittings are applied to the door release in the region of mutually opposed sides, said adjustment fittings being connected both to the appliance door and also to the door leaf, permitting alignment of the door leaf on the appliance door in the vertical and lateral directions and in depth, characterised in that there is attached to the appliance door, or mounted before incorporation of the built-in domestic appliance (10) in the cabinet, on at least two mutually opposed front sides (16, 17) of the appliance door (13), at least one respective fitting (20), the door leaf (60) overlapping the appliance door (13) on all sides by at least the constructive height of the adjustment fitting (20) in the plane of the appliance door (13), plus the desired contact width of the door leaf (60) on the cabinet carcass, at least one vertically adjustable support element (50) being attached to the lower side of the appliance door (13) which, after incorporation of the built-in domestic appliance (10) in the cabinet, is adjusted to the desired height of the lower edge of the door leaf (60), in that, when the appliance door (13) is closed, the door leaf (60) is located with its lower edge on the support element (50) and, being laterally aligned, is pressed against the appliance door (13) and is held in an initial manner by means of adhesive layers of the adjustment fittings (20) on the appliance door (13), in that thereafter, when the appliance door (13), temporarily connected to the door leaf (60), is opened, the adjustment fittings (20) are rigidly connected in the region of their parts projecting over the appliance door (13) to its rear side, and in that, when the support element (50) is removed, the door leaf (60) is aligned vertically, laterally and in depth, and is secured after alignment by means of the adjustment fittings (20).

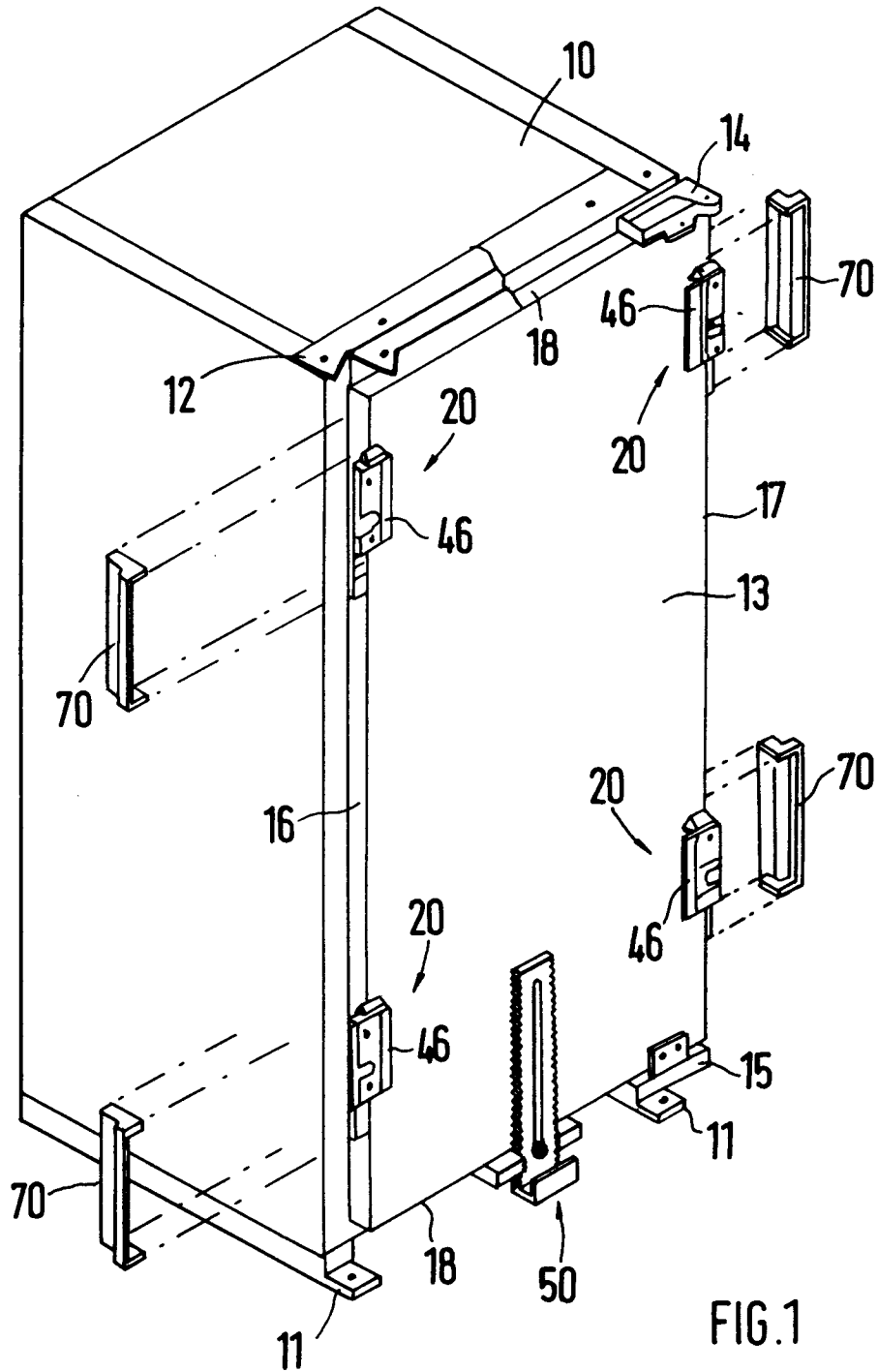
2. Method according to Claim 1, characterised in that, two adjustment fittings (20) are respectively attached to the vertically-aligned front sides (16, 17) of the appliance door (13), said adjustment fittings (20) being located in the end regions facing the lower and upper edge of the appliance door (13).
3. Method according to Claim 1 or 2, characterised in that, before application of the door leaf (60) the adjustment fittings (20) are set to a spacing from the appliance door (13) such that, when the appliance door (13) is closed, it does not, with the initially applied door leaf (60), contact the body of the cabinet.
4. Method according to Claim 3, characterised in that, this spacing is observed by means of securing parts (31) inserted in the adjustment fittings (20) and which, after secure connection to the door leaf (60) are removed from the adjustment fittings (20).
5. Method according to one of Claims 1 to 4, characterised in that, the adjusted and secured adjustment fittings (20) are concealed by cover caps (70).
6. Device for carrying out the method according to one of Claims 1 to 5, characterised in that there is attached to the lower front side of the appliance door (13) a releasable guide plate (51) for an angle bracket (55) as a support element (50), in that the angle bracket (55) has a vertical slot (56) for a fixing screw (59) of the guide plate (51), in that the adjustment fittings (20) have a base portion (24) connectable to the front side (16, 17) of the appliance door (13) and which is adjustable in the longitudinal direction of the front side (16, 17) by means of a set screw (23) adjustable in a bearing portion (21) connectable to the front side (16, 17), in that the adjustment fittings (20) have a panel portion (40) connectable to the rear side of the door leaf (60), and which is provided on the side facing the rear side of the door leaf (60) with an adhesive coating (46) covered by a removable protective layer, and which has a U-shaped receiving means (45) for a fixing screw (47) aligned vertically to the longitudinal direction of the base portion (24), said fixing screw (47) being screwed into a threaded receiving means (38) of a depth adjustment portion (34) located between the base portion (24) and the panel portion (40), and in that the depth adjustment portion (34) is adjustably guided in the base portion (24) transversely to the longitudinal direction of the same, and carries a depth adjustment screw (37) which is adjustable in a threaded receiving means (29) of the base portion (24).

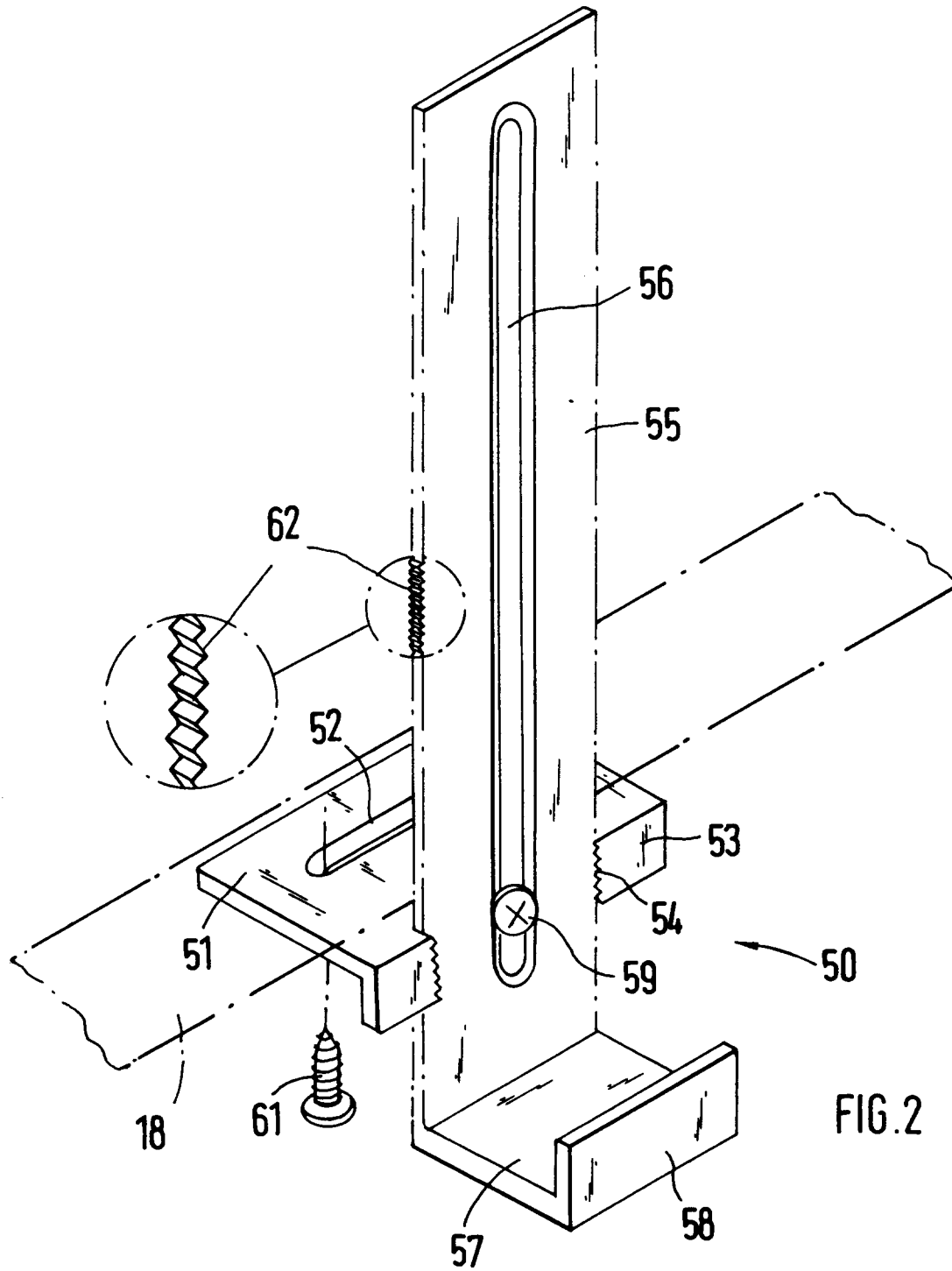
7. Device according to Claim 6,
characterised in that,
the base portion (24) is provided with elongate holes
(25, 27) for fixing screws (26, 28) serving as screws
for fixing the vertical adjustment, the elongate holes 5
(25, 27) being aligned in the longitudinal direction of
the front side (16, 17) of the appliance door (13).
8. Device according to Claim 6 and 7,
characterised in that, 10
the depth adjustment portion (34) has a guide fitting
(35) which is adjustably guided in a guidance receiv-
ing means of the same aligned transversely to the
longitudinal direction of the base portion (24), and
may be locked by means of a fixing screw (48) in the 15
set position, and in addition has a locking projection
(68) which vertically positions the panel portion (40).
9. Device according to one of Claims 6 to 8,
characterised in that, 20
there is inserted between the base portion (24) and
the depth adjustment portion (34) a spacer portion
(31) which, in the initial condition of the adjustment
fitting (20), determines a predetermined spacing
between door leaf (60) and appliance door (13). 25
10. Device according to one of Claims 6 to 9,
characterised in that,
the depth adjustment portion (34) carries a threaded
receiving means (38) for a fixing screw (47) which is 30
passed through the U-shaped receiving means (45)
of the panel portion (40) together with the locking
projection (68), and is supported with one head on
the rear side of the door leaf (60). 35
11. Device according to Claim 8,
characterised in that
the fixing screw (48) is passed through an elongate
hole (36) in the projection (35) of the depth adjust-
ment portion (34), and is screwed into a threaded 40
receiving means (49) in the base portion (24).

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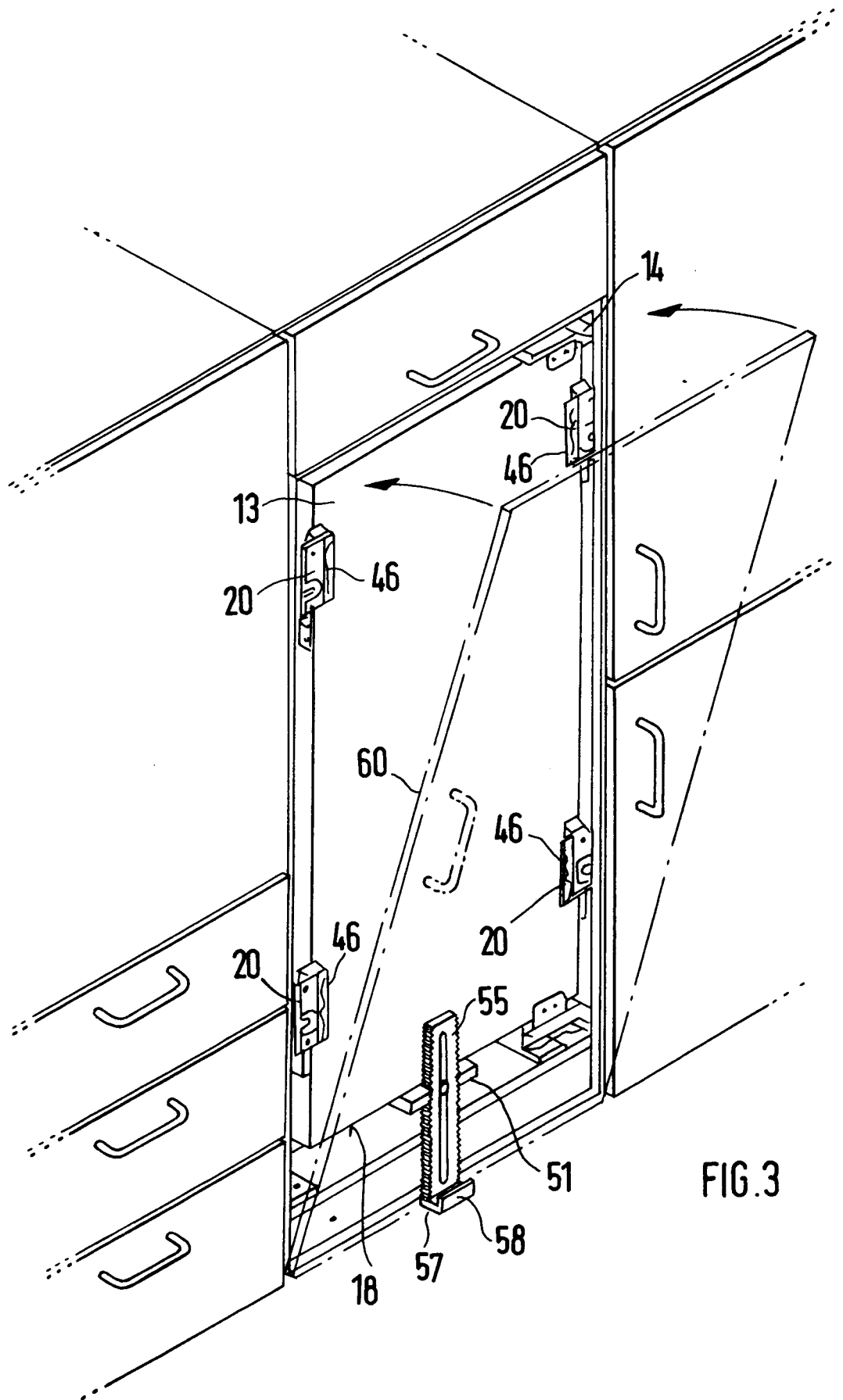


FIG. 3

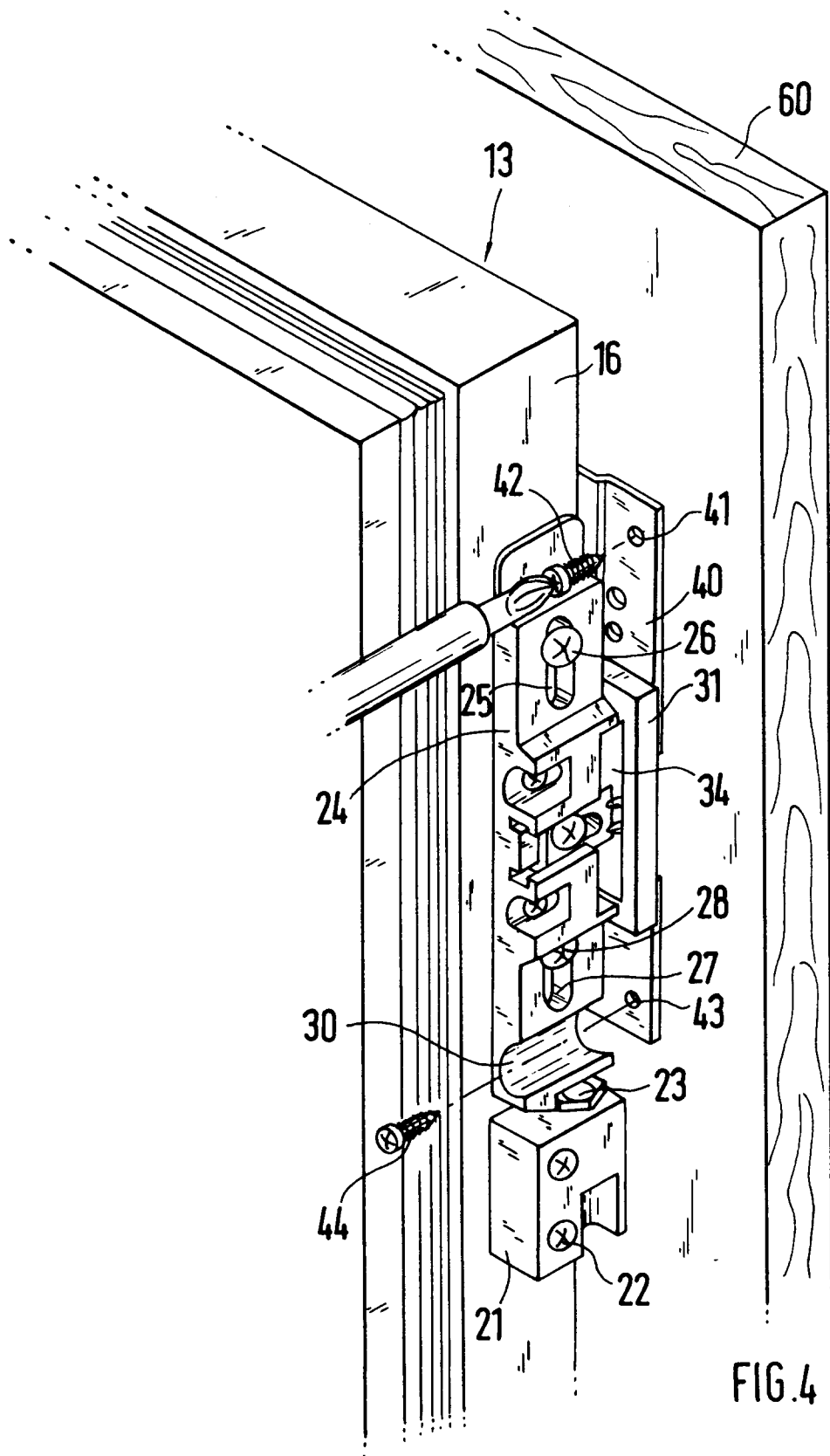


FIG. 4

