April 20, 1965 H. HILFIKER 3,179,214

HINGE CONNECTION FOR DOORS

Filed Nov. 16, 1961 3 Sheets-Sheet 1

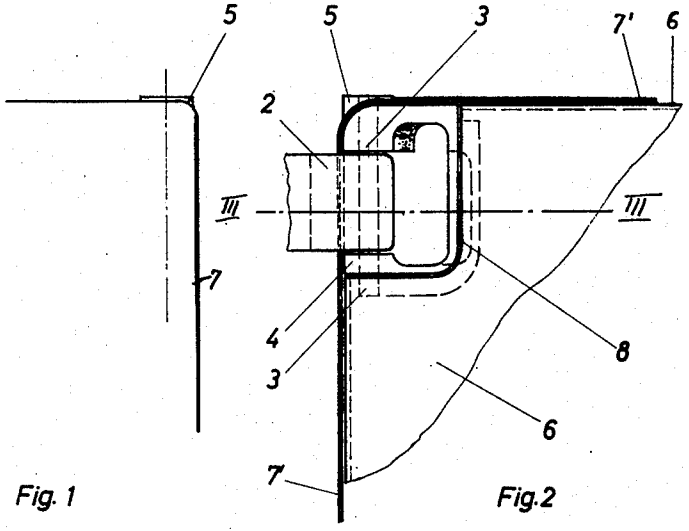

Fig. 1

Fig.2

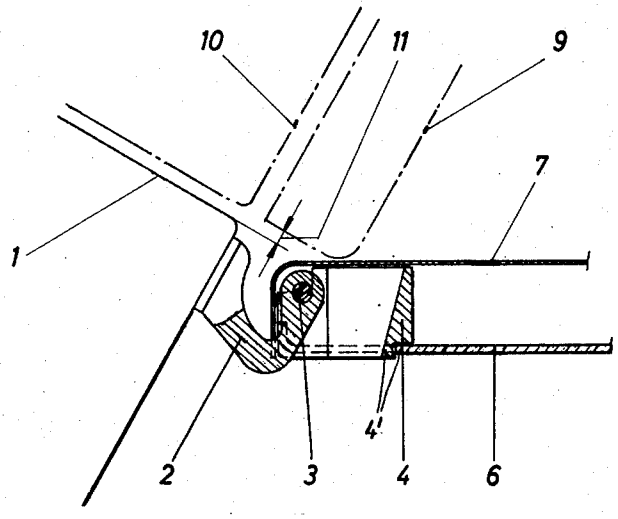

Fig.3

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HINGE CONNECTION FOR DOORS

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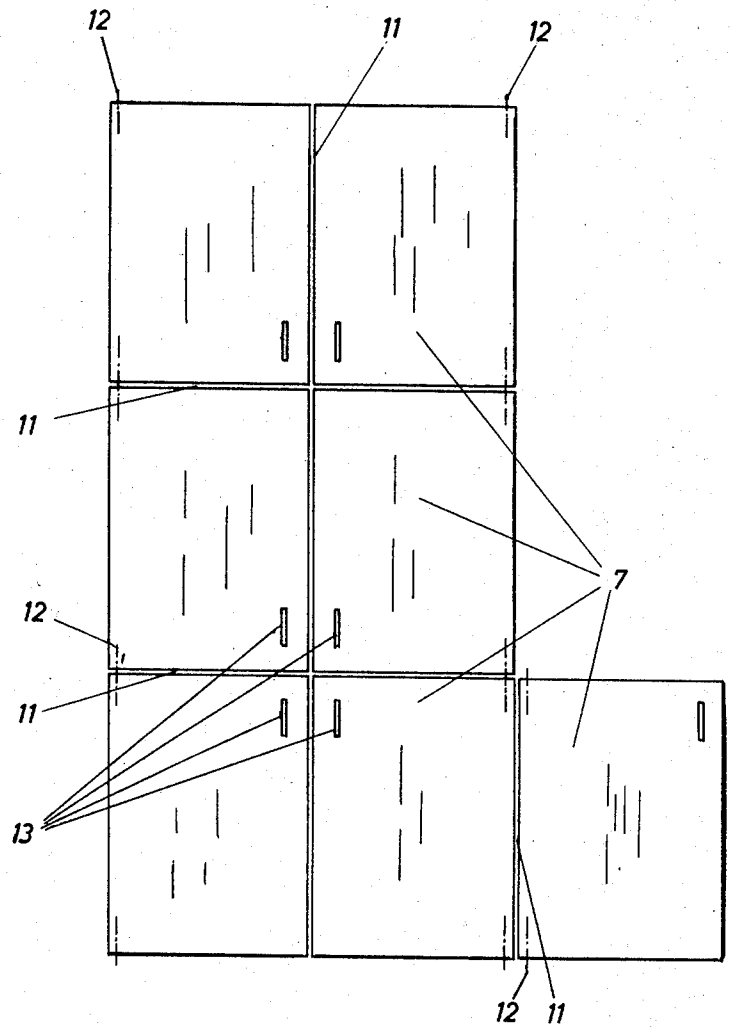

Fig. 4

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HINGE CONNECTION FOR DOORS

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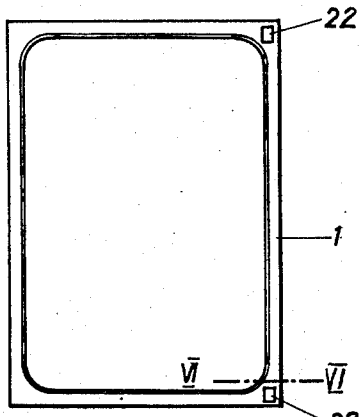

Fig. 5

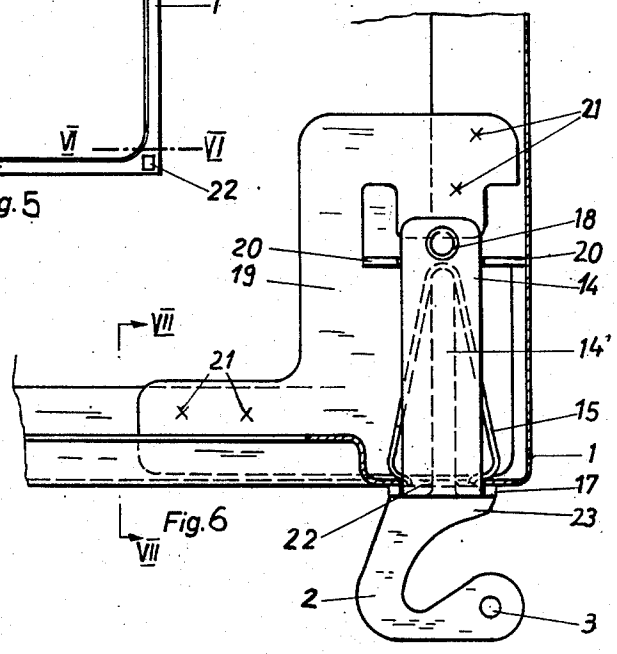

Fig. 6

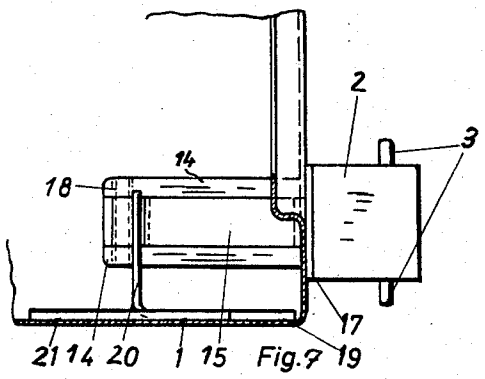

Fig. 7

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HINGE CONNECTION FOR DOORS

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8 Claims. (Cl. 189—46)

The invention relates to a hinge connection for doors of cupboards or cabinets of the type comprising a hinge portion fixed to the cupboard or cabinet casing and a hinge portion carried by the door having a thin-walled outer panel with an inwardly bent edge portion and a thin-walled door double. The term door double designates in this case the lining of the door which faces the side of the cupboard. Doors having an outer wall and a door double made of thin-walled material, for example of sheet metal or synthetic material, are generally known. The bent edge portion of the outer wall serves as stiffening means for the door and at the same time imparts a neat and pleasing outside appearance to the door.

Various ways are known of incorporating door hinges in doors which have a thin-walled outer wall and a thin-walled door double. However, these known kinds of mounting hinges have various disadvantages depending on the particular construction. When the hinges project beyond the width or the height of the door, they prevent a cabinet front from being equipped with a plurality of doors close together with only a small spacing between doors. An arrangement in which cupboards or closets, having approximately the same width and height as the door of the cupboard or closet, are joined together to form a cupboard front, requires in addition that the cupboard door, when opened, does not touch the adjacent door, but needs only a portion of the small spacing for being opened. This requirement can be met by a corresponding position of the axis of the door hinge in the front lateral corner of the cupboard door. Other constructions are known in which the hinge part fixed to the casing of the cupboard is located in a recess or depression provided in the corner of the door. These recesses or depressions, however, interrupt the marginal line of the door rectangle and are not pleasing; furthermore the strength of the door will be reduced by weakening the material in the corner of the door. In certain cases a hinge bracket is welded to the casting of the cupboard and a bearing part is inserted therein and engaging a separate reinforcing angle member welded to the door double. These constructions have the drawback that a force applied to the door must be transmitted from the door first to the door double and then from the latter by means of the hinge to the cupboard. Apart from other separately mentioned disadvantages these constructions are expensive, since they require many parts and numerous operations during fabrication. Weldable hinge supporting parts, such as hinge bolts and fastening brackets are used for mounting the door hinges onto thin-walled cupboard doors, particularly on doors made of sheet metal. Due to the welding operation applied, small interspaces are produced, which adversely influence the quality of the surface treatment of the doors, since acid residues remain therein. Already during production, irregularities and depressions may become visible from the outside on the welding points and require additional work by grinding operations in the subsequent surface treatment, so that such constructions result in high production costs. Deformations on the welding points may also subsequently occur by the stresses imposed on the door during regular use thereof. Furthermore, hinge constructions are known in which one hinge portion is screwed

to the cupboard casing, while the other hinge portion is secured to the door double. In this case the door hinge portion which is fixed on the cupboard is extended through an opening into the door double. The drawback of this construction consists in that the door double then must have sufficient strength, in order to be able to transmit the forces acting on the door. In this connection the sheet metal used for the door mainly serves as lining or facing. In this construction, moreover, it is not possible to transmit the hinge forces entirely in the corner of the door, which results in the disadvantage that more material will be required for equal strength of the door.

Screw connections are mostly employed for securing the hinge to the casing of the cupboard. Particularly when fastening the hinge onto thin-walled cupboard casings which may be produced for example from sheet metal or synthetic material in an especially cheap manner, difficulties arise in mounting the hinges, so that in most cases reinforcing elements must be provided at the casing of the cupboard, which elements enable a perfect transmission of forces from the door over the hinge to the casing without occurrence of any deformations on the cupboard casing. The mounting of the hinges is very cumbersome, particularly when heavy doors are involved, for example the main doors of refrigerators, since the screwing operation has to be carried out partly with the door opened, and the subsequent control of the correct and accurate positioning of the door with respect to the cupboard or closet must be effected with the door closed. As the case may be, a subsequent adjustment will eventually necessitate a repeated opening, setting and closing of the door. In addition the mounting of the hinge requires space and with known hinges results in a relatively large distance between door and cupboard, which fact will not be satisfactory in aesthetic respects. Hinges fastened to the cupboard casing from the outside have the disadvantage that they project beyond the casing and thus are not adapted for the insertion into given openings; in addition they do not have a nice appearance, even when the fastening section is also encased in known manner. Hinge constructions are further known, in which the hinge portion is inserted into the casing of the cupboard and tightly clamped by spring force. However, the known constructions of this type are not suitable for mass production or are too expensive. In these constructions, as a rule, it is also not possible that different doors may be selectively combined with various cupboard casings by mounting the door of the cupboard in the last moment on the desired cupboard, since the production tolerances are too great for ensuring a reliable functioning.

It is an object of the invention to remove these disadvantages. According to the invention, in a hinge connection of the type mentioned, said hinge portion carried by the door is retained in the door corner between said outer panel and said door double by the edge of an aperture formed by cutting a part out of the edge of the door double, the hinge portion fixed to the casing carrying a hinge pin, and said hinge portion carried by the door having two hub members bearing on said hinge pin, one of said hub members fitting into a hole provided in said door corner. The strength of the thin-walled door is only immaterially impaired by the said hole in the corner of the door. The transmission of the force from the door to the cupboard casing is effected through the door corner which is the strongest place in the door, the hub of the hinge part carried by the door and the hinge part secured to the casing of the cupboard. The stresses imposed on the door mainly result in bearing pressure exerted on the internal surface of the hole in the door corner. In case of great stresses acting on the door, the hole in the door corner can additionally be flanged or beaded, so that the forces

due to bearing pressure imposed on said hole remain within admissible limits. Since the hinge portion carried by the door is retained in the door corner by the door double, fastening elements or spot welding points having the disadvantages referred to, are no longer required. The hub of the door hinge portion which is positioned in the hole of the door corner projects only little beyond the outer contour of the door. Cupboards having such hinges thus can be laterally joined together or superposed to form fronts of cupboards with little spacing required between adjacent doors. The door hinge portion may be formed so as to simultaneously line or fill the recess provided at the point of the opening between door and door double. A design of pleasing appearance is thus obtained even with the cupboard door opened. Furthermore, the door hinge portion may advantageously consist of a resiliently yieldable material, such as a polyamide.

In the further evaluation of the invention it is of particular advantage when the fastening of the fixed hinge portion onto thin-walled casings of cupboards is brought about by an insertion of the hinge portion until abutment at the wall of the opening provided in the casing, and maintaining it by means of a spreading or spacer spring arranged on the fixed hinge portion, said spring being rearwardly supported by a tensioning pin, and by inserting a spring ring between the abutment and cupboard casing. This results in that the door together with the mounted hinges can be secured to the cupboard by inserting the two hinge portions to be fixed to the casing from the front into the openings provided in the cupboard casing. The spring tensioning pin takes then care of supporting the spacer spring and after completion of the assembly the door may be taken out again by pushing the spring tensioning pin out through a hole provided in the casing. The tolerance compensation required for the reliable functioning of the spacer spring is obtained by the spring ring inserted between the abutment and the casing of the cupboard. For further structures according to the invention, particularly in case of thin-walled cupboard casings, it is advisable to build a corner bracing into the thin-walled casing of the cupboard, which bracing has a backing member at a distance behind the opening for supporting the inserted part at the side and at the bottom or the top. The stresses exerted upon the door then mainly produce bearing support forces in the opening of the thin-walled cupboard casing, so that deformations of the cupboard casing can be avoided.

The production of the hinge connection and also the mounting of the door hinge into the door is extraordinarily simple, convenient and is obtained at low costs. Mounting the door to the casing of the cupboard thus is a matter of a few seconds and a subsequent adjustment is not necessary particularly with machined openings provided in the cupboard casing and in doors.

The present invention will now be described in more detail with reference to the accompanying drawings illustarting, by way of example, preferred embodiments of the invention, and in which:

FIGURE 1 is a fragmentary front elevational view of a door;

FIGURE 2 shows a view of the inner side of the door when the door is opened;

FIGURE 3 is a horizontal plan view of FIGURE 2 partly drawn in section;

FIGURE 4 is a view of a cupboard front;

FIGURE 5 is a front elevational view of a thin-walled casing of a cupboard;

FIGURE 6 is a partial section on the line VI—VI of FIGURE 5, drawn to an enlarged scale; and

FIGURE 7 is a section on the line VII—VII of FIGURE 6, drawn to a smaller scale than FIGURE 6.

According to FIGURES 1 to 3, the casing of a cupboard **1** carries a fixed hinge portion **2** with a hinge pin **3**. The hinge pin **3** enters into a door hinge portion **4** which consists of resiliently yieldable material, for example of polyamide. Around the pin **3** the door hinge portion **4** forms

two hub portions **5**, one of which engages in a suitable hole in a portion which extends substantially perpendicularly to the outside wall **7**, which in the embodiment shown is the bent over edge **7'** of the outside wall **7** in the corner of the door. The edge of the hole may be flanged or beaded for reinforcing purposes. The door double **6** of the door has an aperture cut out of the edge thereof adjacent the portion **7'**, which in the present embodiment is an aperture **8** in the corner of the door double the edge portion of which engages a shoulder **4'** of the door hinge portion **4** and retains this portion **4** in the door corner. The door hinge portion **4** is formed so that it lines or covers the space provided between the outer wall **7** and the door double **6** at the place of the aperture **8**.

FIGURE 3 shows by dot and dash lines next to the cupboard **1** an adjacent cupboard **10** having a door **9**. As it will be seen, the door can be easily opened in spite of the small door spacing **11**.

A front of cupboards is illustrated in FIGURE 4, comprising seven cupboards, the doors of which being provided with door handles **13**. As evident, a small door spacing **11** is provided between all adjacent doors and the hinge pins **12** may at will be provided in the door corners at the right hand or left hand side of the cupboard.

FIGURE 5 shows the front view of a thin-walled cupboard casing having two openings **22** for inserting the hinge parts to be fixed to the casing. An example of securing the fixed hinge portion in the thin-walled cupboard casing is illustrated in FIGURES 6 and 7. The hinge portion **2** carries the hinge pin **3** and has an abutting portion **23** and an insertion member consisting of two legs **14** and a rib **14'**, the sectional area of said member corresponding to that of the opening **22**, so that this insertion member can be pushed into an opening **22** until it bears against the abutment **23**. A spacer spring **15** is located between the legs **14** of the hinge portion **2**, and a flat spring ring **17** surrounds the legs **14** and is used for compensating the tolerance between the abutment **23** and the casing **1**. The spacer spring **15** is retained in its position by a spring tension pin **18** connecting the ends of the legs **14** and by the rib **14'** provided between the legs **14**. The ends of the spring **15** project into the spring ring **17**, whereby the spring **15** is prevented from dropping out of the hinge portion **2** prior and during the assembly thereof. An angle plate **19** has a cut-out and bent-up backing portion **20** which abuts at both sides and below against the legs **14** and laterally as well as downwardly supports the insertion member formed by the legs **14**. The angle plate **19** is connected for instance at the points **21** to the casing **1**, for example by welding. The casing thereby is stiffened at its corners and heavy loading stresses of the hinges can also be reliably met. A more advantageous solution with respect to costs and a perfect transmission of force is thereby obtained, also for heavy load stresses.

In mounting the door hinges according to FIGURES 1 to 3, it may be proceeded as follows: The hub portions **5** of the resiliently yieldable door hinge portion **4** are spread apart from each other and successively slipped over the projecting ends of the hinge pin **3** of the fixed hinge portion **2**. Then one of the hubs **5**, in the drawing the upper hub **5**, is moved into the hole on the bent-over door edge **7'** and the door double **6** is secured to the sheet metal **7** of the door in the four door corners in proximity to the recess **8**. Subsequently, the fixed hinge portion **2** can be secured to the casing of the cupboard.

In the cupboard securement according to the construction shown in FIGURES 5 to 7, the spring ring **17** has been slipped over the legs **14** before mounting the door hinge portion, then the spacer spring **15** has been placed between the legs **14** of the door hinge portion and the spring tension pin **18** driven in. The two hinges on the door thus can easily be inserted into the openings **22** of the cupboard casing and the spacer springs **15** take care of reliably securing the hinges in the casing of the cupboard. The two springs **15** and **17** act against the direction of the inserting movement. For removing the door,

first the tension pins **18** have to be driven out, whereupon the insertion part **14** of the door hinge portion **2** may easily be pulled out of the opening **22**.

I claim:

1. A hinge and door construction, comprising a door having an outside wall with bent over edges which come together to form a door corner, one of said edges having a hole therein at said corner, said hole being entirely within the material of said one edge, a door double forming the inside wall of said door and having an aperture in the corner thereof corresponding to said door corner and opening inwardly of said door, a door hinge portion positioned in said aperture and bearing against the edges of said door double which defines said aperture and being supported by said edges, said door hinge portion having two hub portions, one of said hub portions extending through and being retained in supporting relationship in said hole in said bent over edge at said door corner, and a fixed hinge portion adapted to be secured to a cabinet or the like, said fixed hinge portion having a hinge pin engaged and retained by said hub portions, whereby when said fixed hinge portion is secured to a cabinet or the like, the bearing forces which arise during the swinging of the door on the hinge pin bear mostly on the edge of the hole in the door corner.

2. A hinge and door construction as claimed in claim 1 in which said door hinge portion has a projecting portion thereon having an outside contour which fills the aperture in said door double at said door corner, and said door hinge portion has a shoulder along the edges thereof which are toward the center of said door, which shoulder bears against the face of the door double opposed to the back of the outside wall of the door adjacent the edges of the aperture.

3. A hinge and door construction as claimed in claim 2 in which said door hinge portion is a resiliently yieldable material.

4. A hinge and door construction as claimed in claim 3 in which said resiliently yieldable material is polyamide.

5. A hinge and door construction as claimed in claim 1 in which said door corner is reinforced around said hole.

6. A hinge and door construction as claimed in claim 5 in which said door corner has a flange around said hole.

7. A hinge and door construction as claimed in claim 5 in which said door corner has a bead around said hole.

8. A hinge construction adapted to be mounted in a door having an outside wall with bent over edges which come together to form a door corner, one of the edges having a hole therein at the corner, and a door double forming the inside wall of the door and having an aperture in the corner thereof corresponding to the door corner, said hinge construction comprising a door hinge portion having a projecting portion thereon having an outside contour adapted to fill the aperture in the door double so that it will be supported by the edges of the door double which define the aperture, said door hinge portion further having a shoulder along the edges thereof which are adapted to be toward the center of the door, which shoulder is adapted to lie against the face of the door double opposed to the back of the outside wall of the door adjacent the edges of the aperture, said door hinge portion having two hub portions, one of said hub portions adapted to extend through and be retained in the hole in the bent over edge at the door corner, and a fixed hinge portion adapted to be secured to a cabinet or the like, said fixed hinge portion having a hinge pin engaged and retained by said hub portions, whereby when said fixed hinge portion is secured to a cabinet or the like and the door hinge portion is mounted in a door with one hub portion through the hole in the bent over edge at the door corner, the bearing forces which arise during the swinging of the door on the hinge pin bear mostly on the edge of the hole in the door corner.

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