

[54] SELF-CLOSING HINGE
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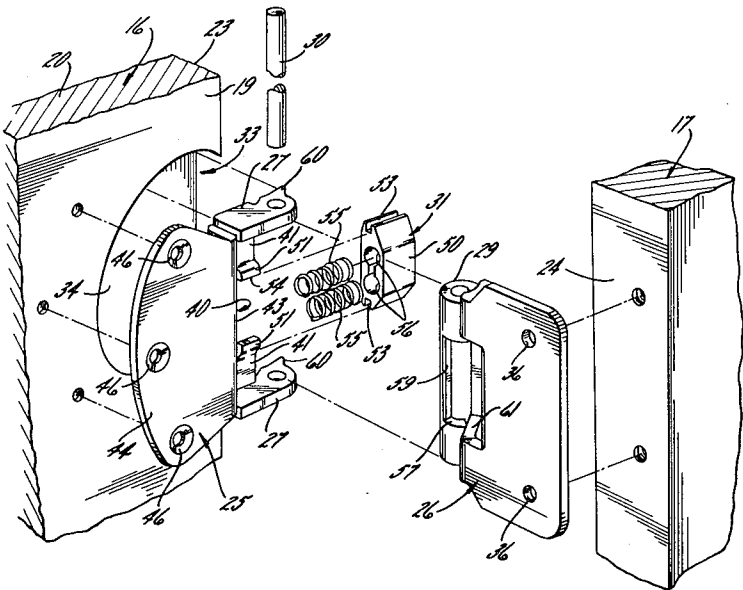
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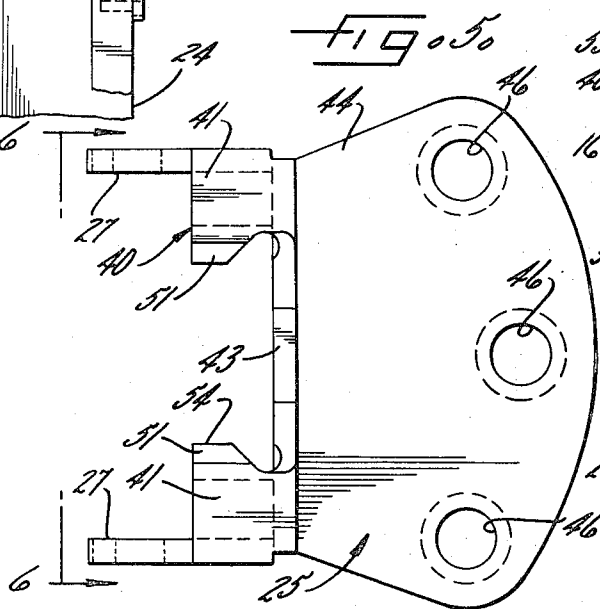
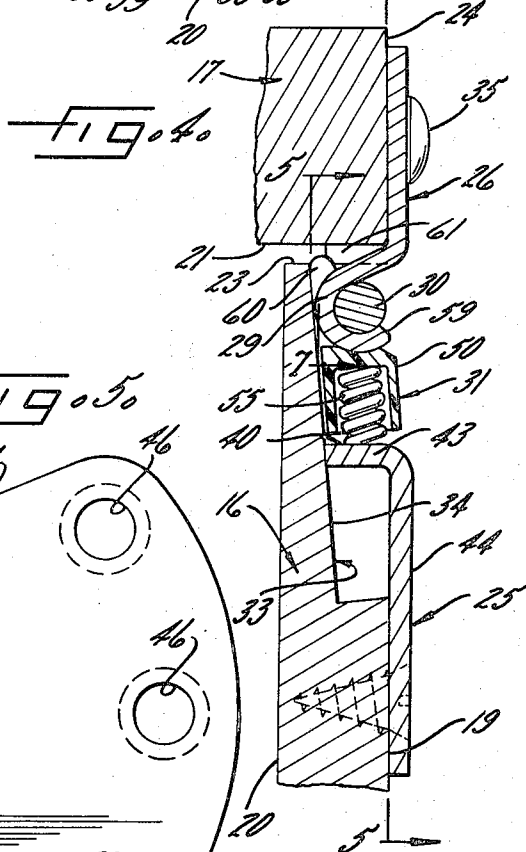
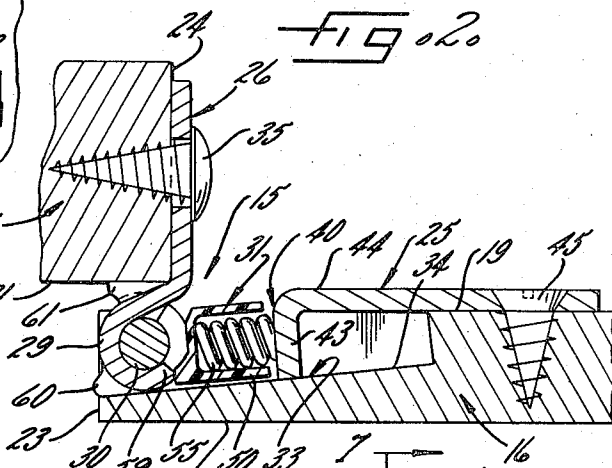
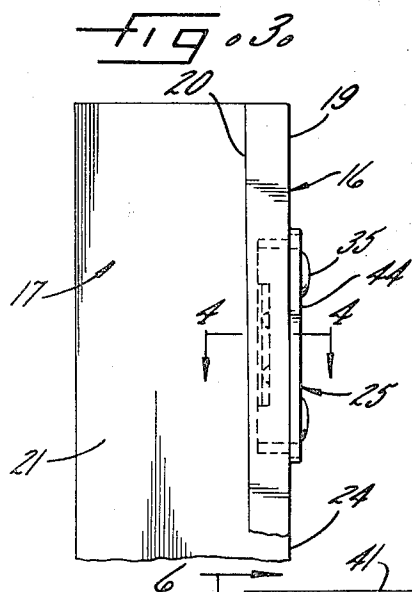
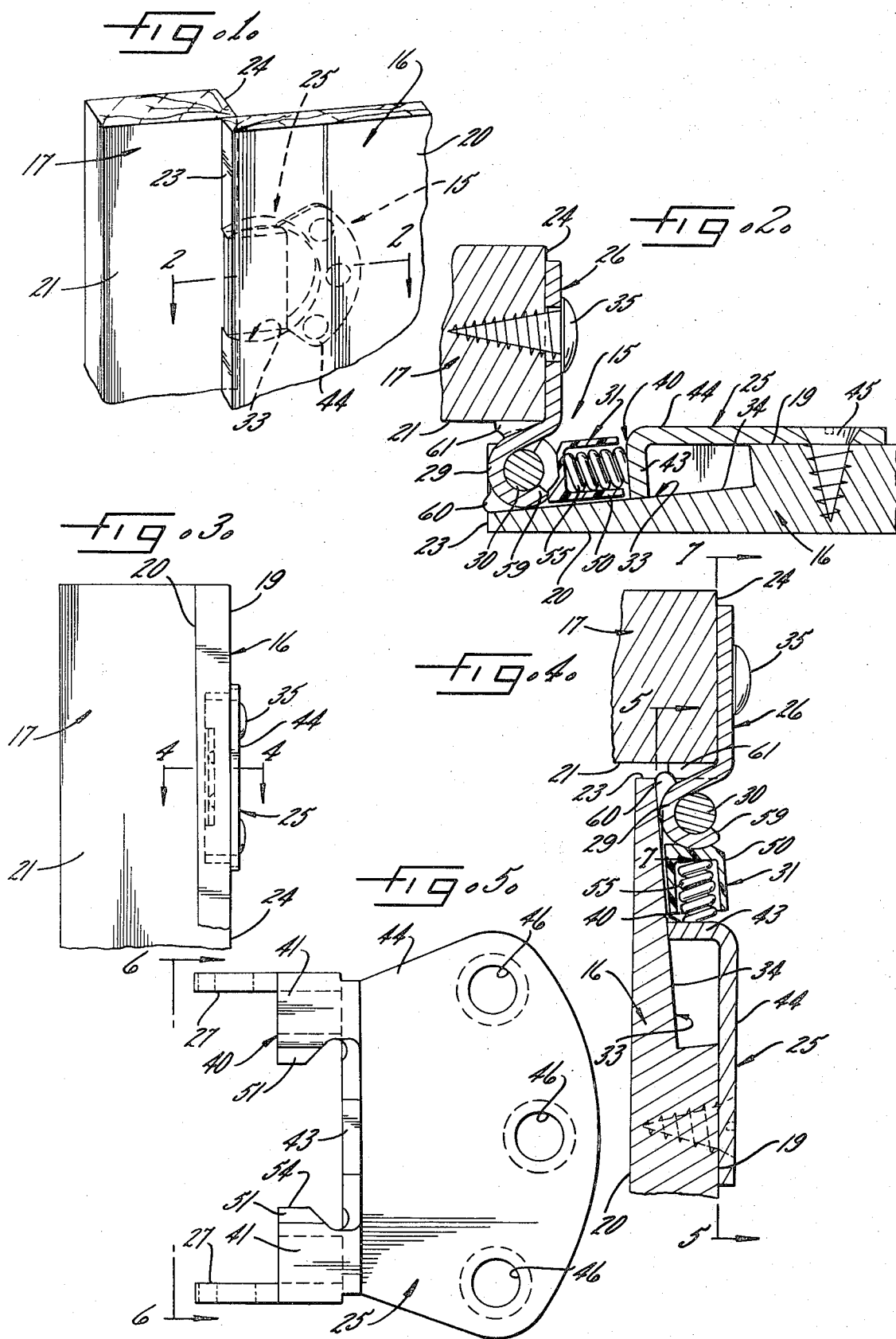
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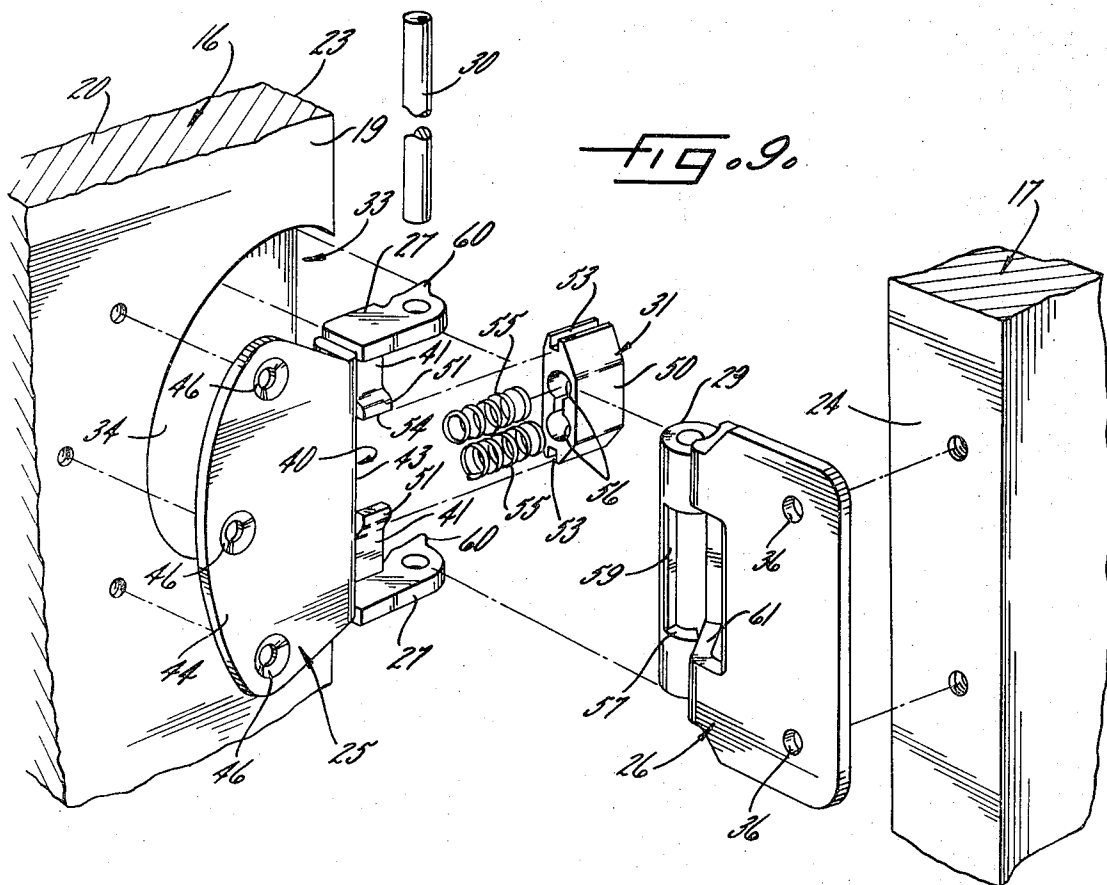
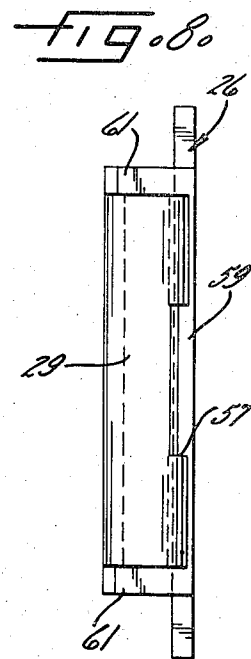
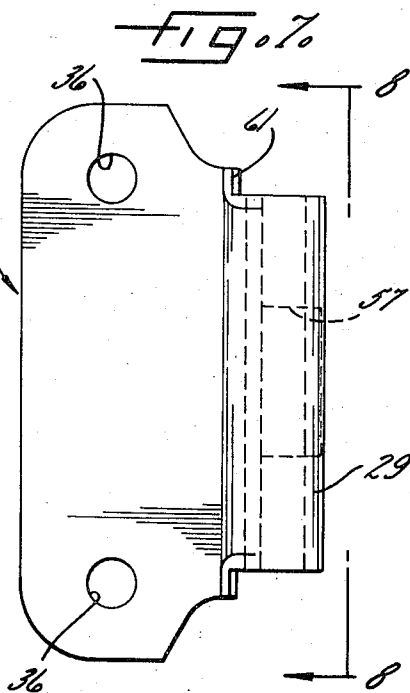
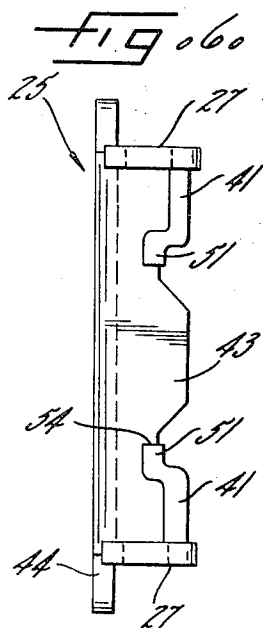
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[57] ABSTRACT
The hinge pin and self-closing mechanism of a self-closing hinge are compactly received in a slot in the inner side of a cabinet door and are concealed from view from the front of the cabinet. In one embodiment, the hinge may be quickly attached to and detached from the door.

12 Claims, 12 Drawing Figures







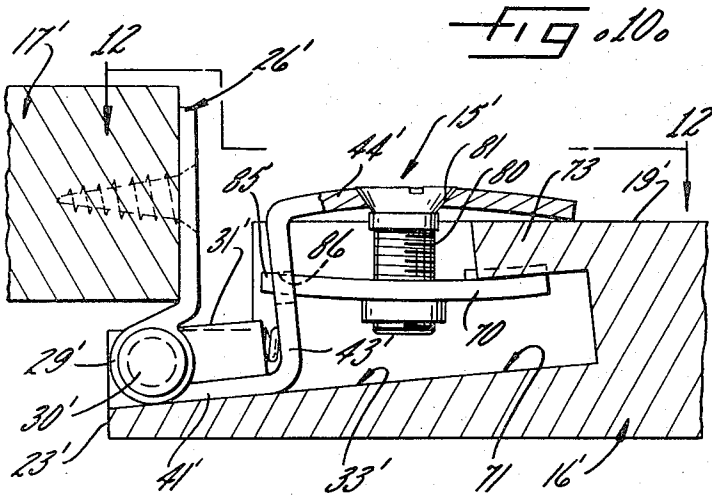


FIG. 11

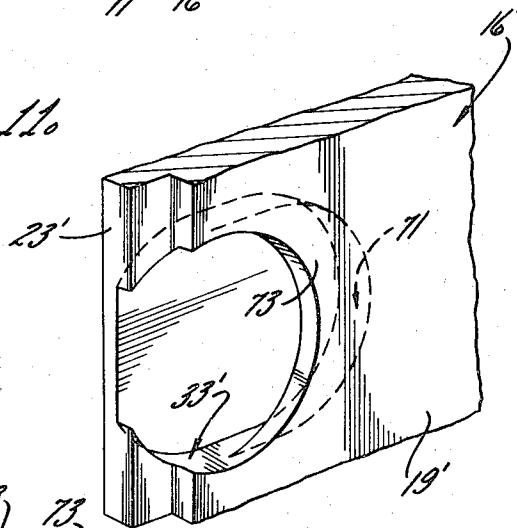
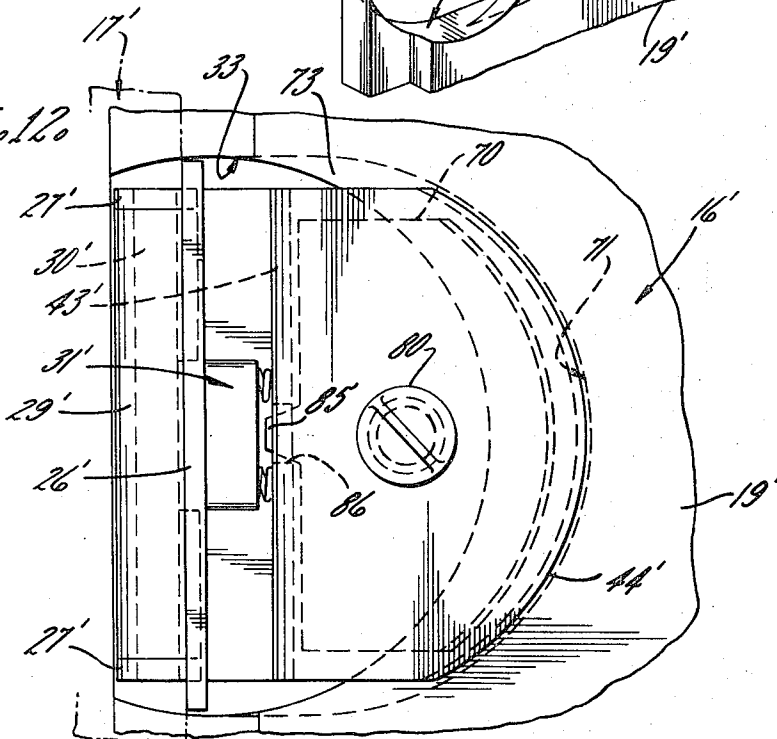


FIG. 12



SELF-CLOSING HINGE

BACKGROUND OF THE INVENTION

This invention relates in general to a hinge and, more particularly, to a hinge for mounting a substantially solid and non-metallic member such as a door for swinging between open and closed positions on a frame member such as a kitchen cabinet. The invention has even more specific reference to a self-closing hinge of the type which is capable of holding the door in a closed position. Hinges of this general character are disclosed in MacDonald U.S. Pat. No. 3,212,124 and Anderson U.S. Pat. No. 3,391,420.

SUMMARY OF THE INVENTION

The general aim of the present invention is to provide a new and improved self-closing hinge which, when compared with prior hinges of the same general type, is better concealed from view from the front of the cabinet.

A more detailed object is to achieve the foregoing through the provision of a unique hinge whose hinge pin and self-closing mechanism are both compactly received in a slot in the inner side of the door and are both concealed by the outer face of the door.

The invention also resides in the comparatively compact arrangement and mounting of the self-closing mechanism to enable substantial concealment of the latter within the slot even when the door is open.

A further object is to provide a hinge of the above character which may be quickly and easily attached to and detached from the door and yet may be anchored rigidly to the door in spite of the existence of the slot.

Still another object of the invention is to provide the hinge with novel means for preventing swinging of the door beyond a given open position, such means being braced in a sturdy manner by the cabinet frame and being effective to transmit directly to the frame further opening forces exerted on the door.

These and other objects and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of a cabinet equipped with a new and improved hinge embodying the novel features of the present invention, the cabinet door being shown in a closed position.

FIG. 2 is an enlarged fragmentary cross-section taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is a front elevational view of the cabinet illustrated in FIG. 1 but with the door shown in an open position.

FIG. 4 is an enlarged fragmentary cross-section taken substantially along the line 4—4 of FIG. 3.

FIG. 5 is an elevational view of the door mounting wing for the hinge and is taken substantially along the line 5—5 of FIG. 4.

FIG. 6 is a view of the door mounting wing as taken along the line 6—6 of FIG. 5.

FIG. 7 is an elevational view of the frame mounting wing of the hinge as taken along the line 7—7 of FIG. 4.

FIG. 8 is a view of the frame mounting wing as taken along the line 8—8 of FIG. 7.

FIG. 9 is an exploded perspective view of the cabinet and the hinge, the cabinet door being shown in a closed position.

FIG. 10 is a view similar to FIG. 2 but shows a quickly detachable hinge incorporating the features of the invention.

FIG. 11 is a fragmentary perspective view of the door shown in FIG. 10.

FIG. 12 is a view taken along the line 12—12 of FIG. 10.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

For purposes of illustration, the hinge 15 of the present invention is shown in the drawings as being used for mounting a substantially solid door 16 made of wood or other non-metallic material for swinging between open and closed positions on the wooden face frame of a kitchen cabinet 17. In this instance, the door is of the overlay type in that, when the door is closed, the inner and outer face surfaces 19 and 20 of the door overlap the outer face surface 21 of the frame while the hinged edge surface 23 of the door is spaced laterally from the adjacent parallel edge surface 24 of the frame.

The hinge assembly 15 comprises door and frame wings 25 and 26 adapted to be mounted on the door 16 and frame 17, respectively, and formed with ears 27 and 29 (FIG. 9) which receive an upright hinge pin 30 serving to connect the door wing for swinging relative to the frame wing. A self-closing mechanism 31 is carried on one of the wings and, after the door has been swung a given distance toward its closed position, the self-closing mechanism is effective to close the door automatically and to hold the door releasably in the closed position.

In accordance with the present invention, the hinge 15 is hidden from view from the front side of the cabinet by locating the hinge pin 30 in a slot 33 formed in the inner face surface 19 of the door 16 and, at the same time, by using the slot to at least partially receive the self-closing mechanism 31 when the door is in a closed position. Being received within the slot, both the hinge pin and the self-closing mechanism are concealed by the outer face surface 20 of the door and, as a result, it is possible to locate the other parts of the hinge in such a manner that the entire hinge is invisible from the front of the cabinet. Thus, the present invention provides a concealed self-closing hinge which is usable with a cabinet door made of wood, chip board or other substantially solid and non-metallic material.

Herein, the slot 33 is of a generally semi-circular configuration, is formed in the inner face surface 19 of the door 16, and terminates short of the outer face surface 20 so that the latter surface remains smooth and unbroken. The slot preferably opens out of the edge surface 23 of the door and is formed with a circular rotary routing cutter (not shown). To minimize the amount of material removed from the door, the outer wall 34 of the slot slants inwardly as the wall progresses from the edge surface 23 toward the opposite closed end of the slot.

The hinge pin 30 is located within the slot 33 in a position just short of the edge surface 23 and is disposed adjacent the outer wall 34 of the slot. The ear 29 of the frame wing 26 is received pivotally on the hinge pin

and, in this instance, comprises a vertically elongated curl which is wrapped around the entire circumference of the pin. At its inner end, the curl 29 is formed integrally with the frame wing which herein comprises a flat plate disposed in face-to-face relation with the edge surface 24 of the frame 17 and secured to the latter by screws 35 passing through holes 36 in the wing. As shown in FIG. 2, the curl 29 and the pin 30 are spaced outwardly from the outer face surface 21 of the frame 17 and overlap the face surface such that one side of the pin is substantially flush with the edge surface 24 and is in a proper position to reduce gaps between the door and the frame.

The self-closing mechanism 31 is preferably but not necessarily mounted on the door wing 25 and, in furtherance of the invention, is uniquely disposed within an inwardly opening pocket 40 formed in the door wing. As shown in FIGS. 5 and 9, the upper and lower sides of the pocket are defined by the ears 27 of the hinge wing 25, such ears herein being formed by apertured knuckles located at the upper and lower ends of the curl 29 and secured rigidly to the pin 20 so that the latter turns with the knuckles 27 when the door 16 is opened. Formed integrally with the knuckles 27 and defining the outer side of the pocket 40 is an outer wall 41 which lies against the outer wall 34 of the slot 33. An additional wall 43 formed integrally with the outer wall 41 projects inwardly from the latter and lies adjacent the closed end of the slot 33 to define one side wall of the pocket, the opposite side wall of the pocket being defined by the curl 29 on the door wing 26. Formed integrally with the inner margin of the inwardly projecting wall 43 is a flat mounting leaf 44 which lies alongside the inner face surface 19 of the door 16 and is secured to the latter by screws 45 extending through holes 46 formed in the mounting leaf. With this arrangement, the various elements 27, 29, 41 and 43 defining the pocket 40 are disposed almost completely within the slot 33 and yet the mounting leaf 44 is located alongside an unslotted portion of the door 16 so that relatively long screws 45 may be used to anchor the mounting leaf to the door.

In this instance, the self-closing mechanism 31 includes a block-like pressure member or plunger 50 made of plastic and advantageously mounted in the pocket 40 to slide toward and away from the hinge pin 30 along a path generally paralleling the plane of the door 16. That is to say, the plunger is mounted to slide toward and away from the edge surface 23 of the door. For this purpose, two guide ribs 51 (FIGS. 5, 6 and 9) are formed integrally with and project inwardly from the outer wall 41 and are fitted into grooves 53 molded in the upper and lower ends of the plunger. To enable the plunger to be received completely within the pocket 50 without projecting inwardly past the mounting leaf 44, a rectangular opening 54 is formed in the outer wall 41 between the guide ribs 51 and accommodates the outer side of the plunger.

Two coil springs 55 (FIG. 9) are telescoped into holes 56 formed in one side wall of the plunger 50 and are compressed between the bottoms of the holes and the inwardly projecting wall 43. The springs bias the plunger along the ribs 51 and toward the hinge pin 30 and urge the opposite side wall or nose of the plunger against the curl 29. When the door 16 is closed, the nose of the plunger 50 is received partially within a notch 57 (FIGS. 7 to 9) formed in the inboard side of

the curl 29 midway between the upper and lower ends thereof and, in this position of the door, the nose bears against an outer edge 59 formed on the curl and defined by one edge of the notch (see FIG. 2). As a result, the plunger urges the door 16 to and holds the door in its closed position. When the door is opened, the plunger rides past the edge 59 and onto the arcuate surface of the curl 29 as shown in FIG. 4 so as to direct the spring force radially through the hinge pin 30 and allow the door to remain in the open position. As the door is swung to a nearly closed position, the major portion of the nose of the plunger moves into the notch 57 and again bears against the edge 59 to snap the door to its closed position and to hold the door releasably in such position.

From the foregoing, it will be apparent that the self-closing mechanism 31 is received in the pocket 40 which, in turn, is received in the slot 33 along with the hinge pin 30 so that both the self-closing mechanism and the hinge pin are hidden in the slot and are concealed from view from the front of the cabinet when the door 16 is closed. The frame wing 25 with its mounting leaf 44 are, of course, concealed behind the door and thus the entire hinge is invisible from the front of the cabinet as long as the door is closed. In addition, the self-closing mechanism 31 is not visible from the free vertical edge of the door when the door is swung to a 90° open position shown in FIGS. 3 and 4 and the mechanism does not protrude laterally into the opening of the cabinet. This is because the self-closing mechanism is mounted on and carried with the door wing 25 and thus remains compactly housed within the pocket 40 even when the door is open.

The present invention also contemplates the provision of novel and comparatively sturdy coacting means on the frame wing 26 and the knuckles 27 for stopping the door 16 from swinging beyond a given open position. Herein, these means comprise two prongs 60 (FIGS. 2 and 9) each formed integrally with the outer side of one of the knuckles and projecting generally radially of the hinge pin 30 so as to extend out of the open end of the slot and just slightly beyond the edge surface 23. When the door has been opened through approximately 90°, the prongs engage a coacting pair of tabs 61 (FIGS. 4, 7 and 8) and prevent further opening of the door so that the latter will not bang against the cabinet.

The stop tabs 61 are formed integrally with the frame wing 26 and are located just above and below the ends of the curl 29. As shown in FIG. 4, the tabs 61 are bent laterally from the frame wing 26 and wrap around the outer face surface 21 of the frame 17, the tabs lying against the face surface and being aligned vertically with the prongs 60.

As a result of the prongs 60 engaging and stopping against the tabs 61 as shown in FIG. 4, the prongs are prevented from digging into and scarring the front surface 21 of the frame 17. In addition, the tabs are backed rigidly by the frame and thus, as the prongs engage the tabs, the tabs are not bent inwardly by further opening forces exerted on the door but instead such forces are transmitted directly to the frame by way of the tabs. Also, the prongs 60 lie against and are backed by the outer wall 34 of the slot 33 as shown in FIG. 4 and thus the prongs are prevented from bending outwardly. Accordingly, the prongs and the tabs constitute relatively rugged means for stopping the door from

swinging past a given open position. Such means are particularly suitable for use in a concealed hinge of the type disclosed since the positioning of the hinge pin 30 and the knuckles 27 in the slot 33 facilitates location of the knuckles closely adjacent the face surface 21 and edge surface 24 of the frame 17 in such a position that the prongs 60 may engage the tabs 61.

A modified hinge 15' is shown in FIGS. 10 to 12 in which parts corresponding to those of the first embodiment are indicated by the same but primed reference numerals. The hinge 15' is substantially the same as the hinge 15 but is adapted for quick and easy attachment to and detachment from the door 16' in generally the same manner as the hinge disclosed in Dargene U.S. Pat. No. 3,590,419.

More specifically, the hinge 15' includes a retaining plate 70 (FIG. 10) adapted to be located in a generally undercut slot arrangement in the cabinet door 16' and adapted to be clamped releasably to the door. As shown in FIGS. 10 and 11, the slot 33' is formed with a relatively long horizontal dimension and the closed end portion of the slot is formed with an undercut section 71 which does not open out of the inner face surface 19' of the door but instead is closed off by an inner lip 73.

The hinge pin 30' and the self-closing mechanism 31' are located in the exposed portion of the slot 33' as before but, in the case of the hinge 15', a somewhat longer inwardly projecting wall 43' joins with a mounting leaf 44' lying alongside the inner face surface 19' of the door 16'. A bolt 80 extends through a hole 81 in the mounting leaf 44' and is threaded into the retainer 70. The latter comprises a generally flat plate disposed within the undercut section 71 of the slot 33' and lying against the outer face of the lip 73.

With the foregoing arrangement, the hinge 15' is installed on the door 16' by inserting the retainer 70 and the bolt 80 into the undercut section 71 and the slot 33', respectively, from the edge surface 23' of the door. Thereafter, the bolt 80 is simply tightened to draw the retainer 70 against the outer face of the lip 73 and thereby clamp the latter between the retainer and the mounting leaf 44'. Importantly, a projecting lug 85 (FIGS. 10 and 12) is formed on one edge of the retainer and fits into a hole 86 formed in the inwardly projecting wall 43'. When the bolt 80 is tightened, the lug 85 is drawn inwardly against the inner face of the hole 86. As a result, the retainer 70 is held generally parallel to the lip 73 and is prevented from fulcruming inwardly about the lip. The lug thus distributes the clamping force applied by the bolt and keeps the retainer 70 in tight clamping engagement with the lip 73.

To detach the door 16' from the hinge 15', it is necessary only to loosen the bolt 80 and to slide the door edgewise away from the hinge. Thus, the hinge 15' is concealed like the hinge 15 of the first embodiment and, in addition, may be quickly attached to and detached from the door.

We claim as our invention:

1. The combination of a frame, a substantially solid and non-metallic door and a hinge assembly for connecting the door to the frame for swinging between open and closed positions, said door having an edge portion defined by an edge surface and by inner and outer face surfaces, a slot formed in the inner face surface of said door adjacent said edge surface and termi-

nating short of said outer face surface, said hinge assembly comprising a hinge pin, door and frame wings connected to said door and frame, respectively, and each having an ear received on said hinge pin, said door wing being swingable in an arc about a fixed axis defined by the axis of said hinge pin, said hinge pin being positioned within said slot and concealed from view from the outer face surface of said door, a spring-urged pressure member mounted on one of said wings and engageable with the ear of the other wing to urge said door to said closed position, said pressure member being at least partially received in said slot and being biased substantially radially toward said hinge pin in all positions of said door, said pressure member being biased toward said edge surface of said door when the latter is in said closed position.

2. The combination defined in claim 1 in which said door wing is formed with a pocket located adjacent said hinge pin and defined by an outer wall which extends generally edgewise of the plane of the door and by an inwardly projecting wall which extends inwardly from said outer wall when said door is in said closed position, said outer wall being integral at one end with said inwardly projecting wall and being integral at its other end with the ear on said door wing, said door wing further including a mounting leaf integral with said inwardly projecting wall and extending generally parallel to said outer wall, said mounting leaf lying against the inner face surface of said door and being spaced inwardly from said outer wall when said door is in said closed position, and said outer wall lying against the outer wall of said slot.

3. The combination defined in claim 2 in which said pressure member is disposed within said pocket and is engageable with the ear on said frame wing, said pressure member being guided by the outer wall of said pocket to move toward and away from said hinge pin, and a spring received within said pocket and loaded between said inwardly projecting wall and said pressure member to urge the latter toward said hinge pin and in a direction extending generally edgewise of the plane of said door.

4. The combination defined in claim 3 further including an opening formed in the outer wall of said pocket and at least partially receiving said pressure member, guide ribs formed on said outer wall and defining opposite edges of said opening, and grooves formed in opposite ends of said pressure member and slidably receiving said ribs to guide the pressure member for movement toward and away from said hinge pin.

5. The combination defined in claim 2 in which said slot is formed with an undercut section extending beyond the closed end of said slot, the inner side of said undercut section being covered by a lip defined by a portion of the door, a retainer disposed within said undercut section, and a bolt extending through said mounting leaf and threaded into said retainer and adapted when tightened to clamp said mounting leaf and said retainer to said lip.

6. The combination as defined in claim 5 further including a hole formed in said inwardly projecting wall, and a lug formed on one edge of said retainer and projecting into said hole, said lug being positioned to engage the inner wall of said hole and restrict fulcruming of said retainer on said lip when said bolt is tightened.

7. The combination of a frame having an edge surface and an outer face surface, a substantially solid and non-metallic door, and a hinge assembly for connecting the door to the frame for swinging between open and closed positions, said door having an edge portion defined by inner and outer face surfaces which overlap the outer face surface of said frame when said door is in said closed position, said edge portion being further defined by an edge surface when is offset from the edge surface of said frame when said door is in said closed position, a slot formed in the inner face surface of said door, terminating short of the outer face surface of said door and opening out said edge surface of said door, said hinge assembly comprising door and frame wings mountable on said door and said frame, respectively, a hinge pin interconnecting said wings for swinging of said door wing in an arc about a fixed axis defined by the axis of said hinge pin, said hinge pin being positionable within said slot adjacent said edge surface of said door so as to be concealed when viewed from the outer face surface of said door, the distance between the axis of said hinge pin and the plane of the edge surface of said door being constant in all positions of said door, and a spring-urged pressure member supported by one of said wings and biased substantially radially toward said hinge pin in all positions of said door, said pressure member being at least partially received in said slot when said door is in said closed position.

8. A hinge assembly for use in connecting a door for swinging between open and closed positions relative to a frame, said hinge assembly comprising a hinge pin, door and frame wings mountable on said door and frame, respectively, and each having an ear received on said hinge pin, said door wing being swingable relative to said frame wing and in an arc about a fixed axis defined by the axis of said hinge pin, said door wing having a pocket located adjacent said hinge pin and defined by an outer wall which extends generally edge-wise of the plane of the door and by an inwardly projecting wall which extends inwardly from said outer wall when said door is in said closed position, said outer wall being integral at one end with said inwardly projecting wall and being integral at its other end with the ear on said door wing, said door wing further including a mounting leaf integral with said inwardly projecting wall and extending generally parallel to said outer wall, said mounting leaf being spaced inwardly from said outer wall when said door is in said closed position, a pressure member disposed within said pocket and engageable with the ear of said frame wing, an opening formed in the outer wall of said pocket and at least partially receiving said pressure member, guide ribs formed on said outer wall and defining opposite edges of said opening, grooves formed in opposite ends of said pressure member and slidably receiving said ribs to guide the pressure member for movement toward and away from said hinge pin, and a spring received within said pocket and loaded between said inwardly projecting wall and said pressure member to urge the latter toward said hinge pin and in a direction extending generally edgewise of the plane of said door.

9. A hinge assembly for use in connecting a door for

swinging between open and closed positions relative to a frame, said hinge assembly comprising a hinge pin, door and frame wings mountable on said door and frame, respectively, and each having an ear received on said hinge pin, said door wing being swingable in an arc about a fixed axis defined by the axis of said hinge pin, said door wing having a pocket located adjacent said hinge pin and defined by an outer wall which extends generally edgewise of the plane of the door and by an inwardly projecting wall which extends inwardly from said outer wall when said door is in said closed position, said outer wall being integral at one end with said inwardly projecting wall and being integral at its other end with the ear on the door wing, said door wing further including a mounting leaf integral with said inwardly projecting wall and extending generally parallel to said outer wall, said mounting leaf being spaced inwardly from said outer wall when said door is in said closed position, a pressure member mounted on one of said wings and received at least partially in said pocket when said door is in said closed position, means guiding said pressure member to move linearly and substantially radially toward and away from said hinge pin in all positions of said door, and a spring mounted on said one wing and urging said pressure member against the ear of the other wing and in a direction extending substantially edgewise of the plane of said door when the latter is in said closed position.

10. A hinge assembly as defined in claim 9 further including a retaining plate which is spaced outwardly from said mounting leaf when said door is in said closed position, and a bolt extending through said mounting leaf and threaded into said retaining plate and adapted when tightened to draw the retaining plate toward the mounting leaf.

11. A hinge assembly as defined in claim 10 further including a hole formed in said inwardly projecting wall, and a lug formed on one edge of said retaining plate and projecting into said hole.

12. A hinge assembly for connecting a door for swinging between open and closed positions relative to a frame having an outer face surface, said door having an inner face surface which overlaps the outer face surface of said frame when said door is in said closed position, said frame also including an edge surface extending generally perpendicular to the outer face surface of the frame, said hinge assembly comprising a hinge pin, door and frame wings each having an ear received on said hinge pin, said door wing being mountable on the inner face surface of said door and swinging in an arc about a fixed axis defined by the axis of said pin when said door is moved between said positions, said frame wing being mountable on the edge surface of said frame and being formed with an integral tab wrapped around and lying in contact with the outer face surface of said frame, and a prong projecting generally radially from the ear on said door wing and engageable with said tab upon swinging of said door to said open position thereby to prevent further opening of said door and to transmit through the tab and to the frame further opening forces imposed on the door.

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