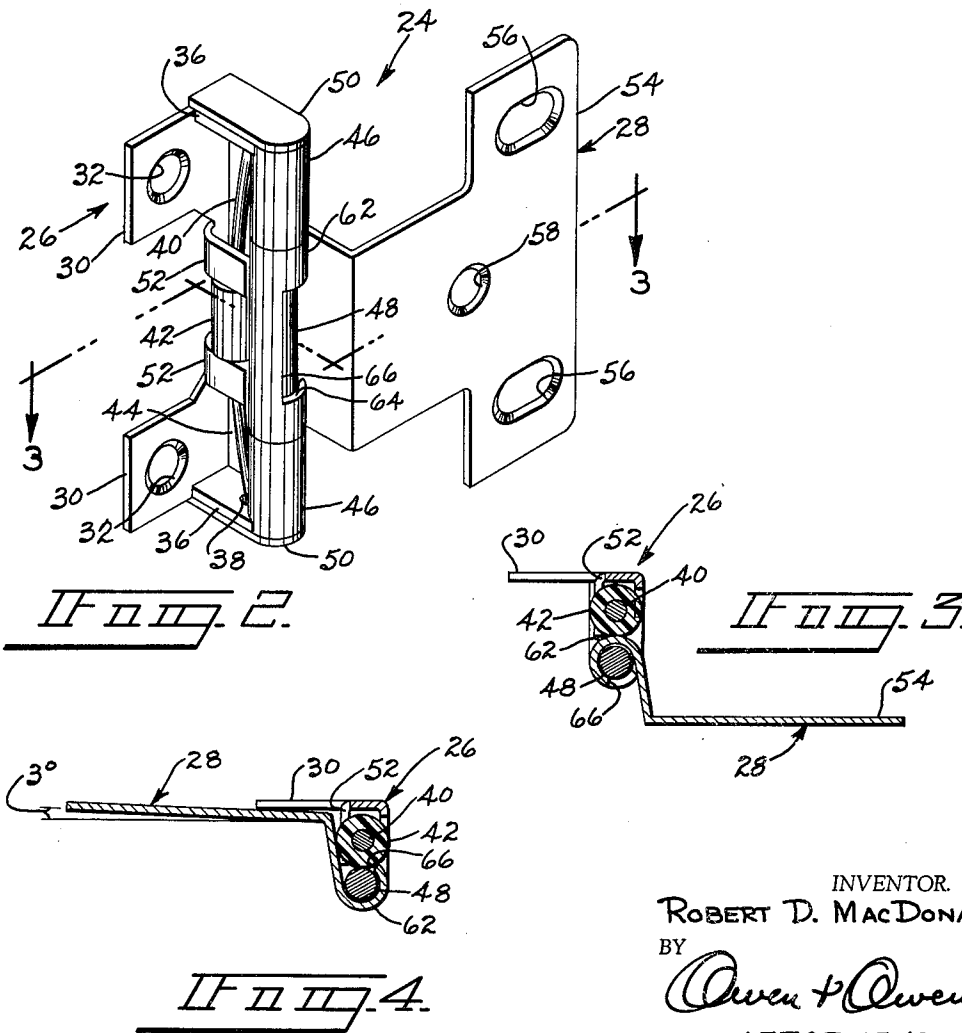


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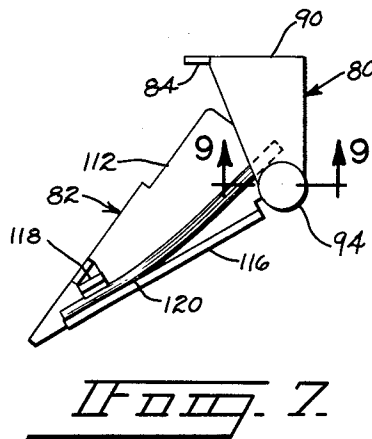
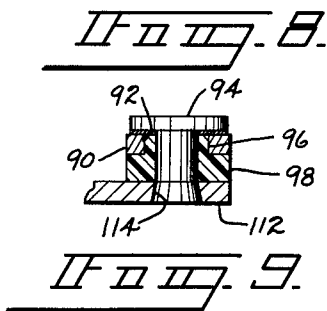
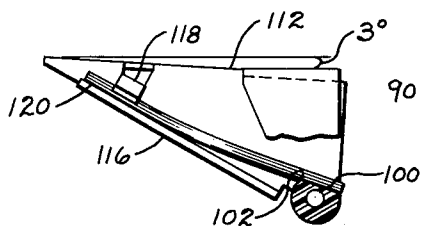
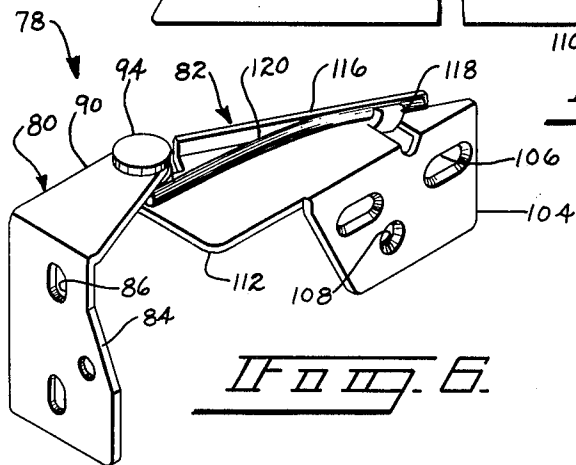
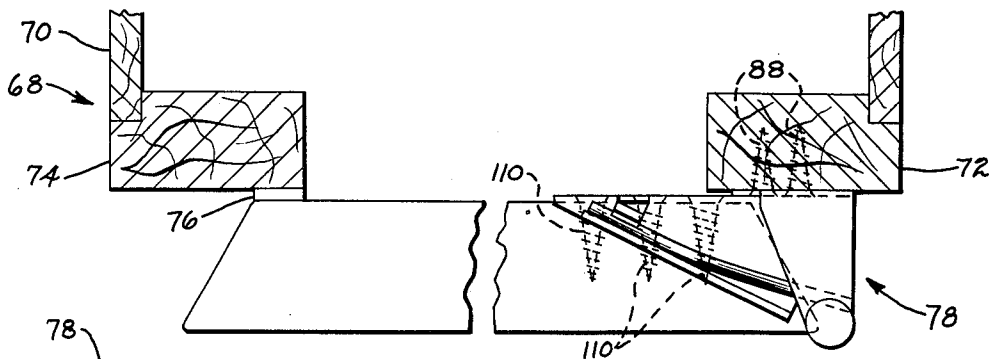
Sept. 14, 1965

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LATCHLESS DOOR HINGE

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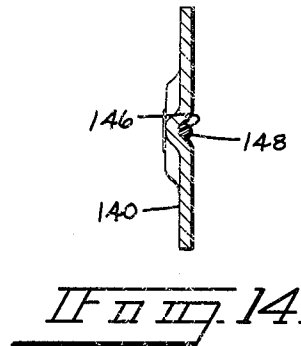
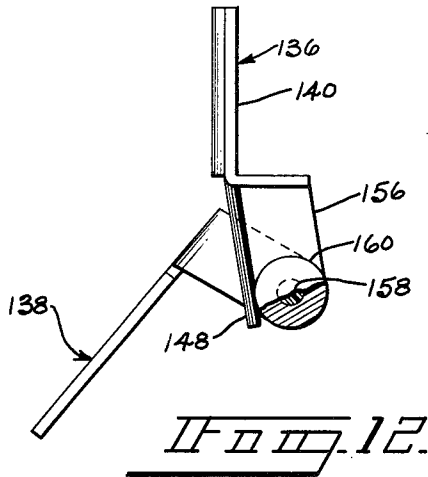
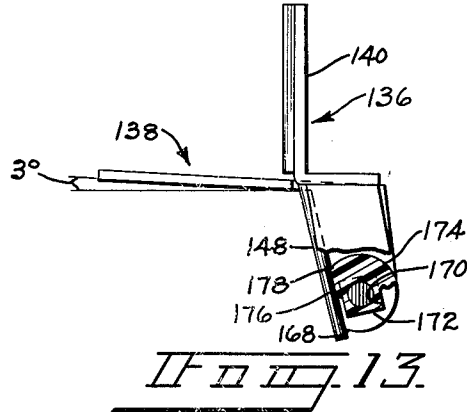
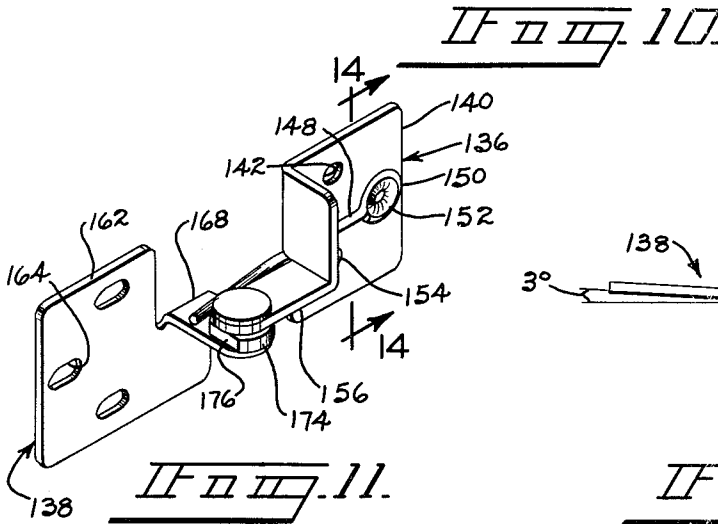
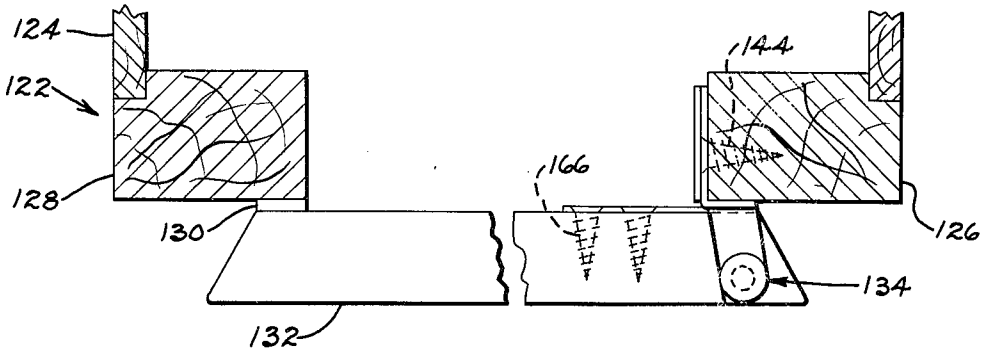
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LATCHLESS DOOR HINGE

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3 Sheets-Sheet 3



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LATCHLESS DOOR HINGE

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This invention relates to an improved hinge for latchless doors and more particularly to a hinge capable of urging a door toward and beyond its closed position so that the door remains securely closed without the necessity of employing a latch.

Hinges of the general nature with which the present invention is concerned are designed to keep a door tightly closed without any latch at all and are primarily used for small doors, such as for cabinets. To accomplish this, the hinge has a spring on one portion which contacts an engageable part on a second portion in such a manner that the door is urged beyond its normally-closed position. Hence, the door, when closed, is continuously urged against the door stop and a latch is not necessary. Elimination of the latch eliminates the cost of it and the cost of installation, which is often a time consuming procedure in order to align the latch components properly. Further, the latch components often become misaligned during changes in the weather, particularly during periods of high and low humidity, so that readjustment is periodically required. Misalignment also occurs during wear of the components and settlement of the building containing the door and door frame. Hinges of this nature also have the advantage of closing the door tightly without bouncing, even if it is slammed shut.

The latchless door hinge according to the invention has several advantages over those heretofore known. The new hinge is less expensive, having fewer components and less complicated ones. The new hinge also has increased closing power which is particularly advantageous for heavier doors, such as those for large cabinets. In addition, the hinges can be pre-assembled in order to reduce field labor rather than having to be assembled on the job site when the doors are hinged to the frames.

It is, therefore, a principal object of the invention to provide a latchless door hinge having the advantages outlined above.

Other objects and advantages of the invention will be apparent from the following detailed description of preferred embodiments thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a fragmentary plan view, with parts in cross section, of a cabinet, latchless door, and hinge embodying the invention;

FIG. 2 is an enlarged view in perspective of the hinge shown in FIG. 1, but in an open position;

FIG. 3 is a view in horizontal cross section taken along the line 3—3 of FIG. 2;

FIG. 4 is a view in cross section similar to FIG. 3, but with the hinge in a closed position;

FIG. 5 is a fragmentary plan view, with parts in cross section similar to FIG. 1, but showing a modified hinge;

FIG. 6 is an enlarged view in perspective of the hinge shown in FIG. 5, but in an open position;

FIG. 7 is a plan view of the hinge shown in FIG. 6;

FIG. 8 is a plan view of the hinge of FIGS. 5-7, in a closed position, with parts broken away and with parts in cross section;

FIG. 9 is a detailed view in cross section taken along the line 9—9 of FIG. 7;

FIG. 10 is a view similar to FIGS. 1 and 5 but showing a further modified hinge;

FIG. 11 is an enlarged view in perspective of the hinge shown in FIG. 10, but in an open position;

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FIG. 12 is a plan view of the hinge of FIG. 11, with parts broken away and with parts in section;

FIG. 13 is a plan view of the hinge of FIGS. 10-12, in a closed position, with parts broken away and with parts in section; and

FIG. 14 is a view in cross section taken along the line 14—14 of FIG. 11.

Referring to the drawings, and more particularly to FIG. 1, a cabinet indicated at 10 includes side walls 12, a hinge frame member 14, and a door stop frame member 16. The latter includes a suitable door stop bumper 18 which can also be affixed to a door 20 instead, if desired. The door 20, as shown, is of the overlay type, being slightly larger than the cabinet opening, and has beveled edges 22 which enable the door to be opened without the use of a door knob.

A butt hinge 24, two or more of which are employed with the door 20, includes a first portion 26 which is attached to the hinge frame member 14 and a second portion 28 which is affixed to the inner surface of the door 20. The first portion 26 includes a back plate 30 having openings 32 therein to receive screws 34 which are turned into the frame member 14 to affix the first hinge portion 26 thereto. The plate 30 extends inwardly, in this instance, toward the cabinet opening so that the screws 34 are at least partially hidden by the door 20, when closed. A pair of end tabs 36 are bent upwardly from the hinge plate 30 with the tabs 36 having notches 38 therein to receive, position, and support a resilient spring rod 40 which can be of spring wire or other suitably tempered metal. The rod 40 extends longitudinally of the hinge portion 26 and includes an enlarged pressure member 42 at an intermediate portion thereof urged outwardly away from the hinge plate 30 by the rod 40 which is maintained in a sprung or bowed position. A side plate 44 is bent upwardly from the back plate 30 and is curved at its end portions to form hinge pin bearing sleeves 46 to receive a hinge pin 48. End ears 50 are bent from the ends of the side plate 44 to hold the pin 48 in place. The ears 50 overlap the spring rod tabs 36, in this instance, so that they help to retain the spring rod 40 in place. Retaining ears 52 also are bent upwardly from intermediate portions of the back plate 30, on each side of the enlarged member 42, to retain the member 42 and the rod 40 in position.

The second hinge portion 28 includes an offset, T-shaped hinge plate 54 having elongate openings 56 and a circular opening 58 therein to receive screws 60 by means of which the plate 54 can be attached to the inner surface of the door 20. The plate 54 includes an intermediate sleeve bearing 62 which can be aligned with the sleeve bearings 46 when inserted therebetween to receive the hinge pin 48. The pin 48 extends through the intermediate sleeve bearing 62 to enable the second hinge portion 28 to be pivotally connected to the first hinge portion 26. The intermediate bearing 62 differs from the end sleeve bearings 46 in one important respect. The sleeve bearings 62 has a notch 64 which is sufficiently long and wide to receive a portion of the pressure member 42 when the door is closed. The bearing 62 and a recess edge or engageable part 66 hold the spring rod 40 in a sprung position displaced from its normal or unsprung position so that the member 42 rides on the edge 66 with the force of the spring rod 40 transmitted through the enlarged member 42 and the edge 66 to one side of the hinge pin 48. Torque thereby is provided which urges the door to a position beyond its closed position, forming an angle of approximately 3° (FIG. 4) with the closed position, with an angle from about 2° to at least 10° being suitable. The position of the part or edge 66 of the notch 64 determines the extent to which the door 20 will tend to move beyond the closed position, for a given

size of the pressure member 42 and position of the spring rod 40.

When the door 20 is open, and the hinge 24 is as shown in FIGS. 2 and 3, the pressure member 42 rides against the intermediate sleeve 62 because of the force of the spring rod 40, but the force exerted on the sleeve 62 is on a line directly through the pin 48 so that the spring rod 40 has no appreciable effect upon the opening and the closing of the door 20, only producing a slight drag. As the door 20 moves toward its closed position, and reaches an angle of about 25° to the plane of the front of the cabinet 10, the pressure member 42 begins to move past a position which is tangential to the sleeve 62 at the part 66. When this occurs, the force of the spring rod 40 will act through the part 66 and the line of force will pass to one side of the hinge pin 48 and establish torque which urges the hinge portion 28 and the door 20 toward the closed position. This torque continues to be applied even after the door 20 reaches its closed position, against the bumper 18, and would move the hinge portion 28 until the pressure member 42 would hit the hinge pin 48 or contact the hinge plate 54 on the opposite side of the recess 64, or until the back plates 30 and 54 contacted one another. Since the door cannot move beyond the closed position against the bumper 18, the force of the spring rod 40 thereby continues to act upon the door and retain it in the closed position. Because of the continuous action of the force, any bouncing of the door 20, even if slammed shut, is held to a minimum.

From the above discussion and description, it will be seen that the hinge 24 is relatively uncomplicated and can be produced quite inexpensively. Further, the spring rod 40 can be of almost any suitable size so as to produce a wide variation in force upon the edge 66 of the hinge member 28. It may also be noted that the spring 24 can be fully assembled during the manufacture thereof so that the only field labor involved is attaching the back plate 30 of the hinge portion 26 to the frame member 14 and attaching the plate 54 of the hinge portion 28 to the door 20.

Referring to the modification of FIGS. 5-9, a cabinet 68 includes side walls 70, a hinge frame member 72, and a door stop frame member 74 having a bumper 76. A door 77, again of the overlay type in this instance, covers the cabinet opening and is hinged to the frame member 72 by a modified hinge 78 embodying the invention. The hinge 78 includes a first portion 80 and a second portion 82 pivotally connected thereto. The first portion 80 includes a back plate 84 having openings 86 to receive screws 88 which are turned into the hinge frame member 72 to affix the hinge 78 thereto. The first portion 80 also includes an extension plate 90 having a pivot pin opening 92 (FIG. 9) at the outer end thereof to receive a pivot pin or rivet 94. The opening 92 is larger than the pin 94 and is of non-circular shape to receive a non-circular projection 96 of a sleeve bearing 98. The bearing 98 has a flat surface 100 (FIG. 8) forming an edge or engageable part 102.

The second portion 82 of the hinge 78 includes a back plate 104 having openings 106 and 108 to receive screws 110 which are turned into the door 77 to affix the hinge portion 82 thereto. The portion 82 also includes an extension plate 112 which extends past the upper or lower edge of the door 77, the edges being recessed for the extension 112, if desired. The extension 112 has an opening 114 near the outer end thereof to receive an end of the pivot rivet 94 which is then flared to form a permanent pivotal connection between the portions 80 and 82. The sleeve bearing 98 between the extensions 90 and 112 facilitates pivotal movement between them, the bearing 98 preferably being of a slippery plastic material such as Teflon or Delrin. The extension 112 has an upturned flange 116 along a diagonal edge thereof and an upturned retaining ear 118 struck upwardly from the extension 112 and spaced from the flange 116. A spring rod 120 is

held between the flange 116 and the ear 118 with the free end of the rod 120 riding on the bearing 98. The bearing holds the rod 120 in a sprung position displaced from its normal or unsprung condition.

When the door 77 is opened, the hinge 78 is in the position shown in FIGS. 6 and 7 with the free end of the spring rod 120 contacting the arcuate portion of the bearing 98 with the force of the spring rod 120 being directed through the pivot pin 94. Hence, only a slight drag results and this is kept to a minimum because of the minimum friction between the rod 120 and the bearing 98.

As the door 77 is moved toward a closed position and forms an included angle of roughly 25° with the face of the cabinet 68, the spring rod 120 comes in contact with the part 102 of the bearing 98 and begins to exert a force to one side of the pivot pin 94 as it moves beyond a position tangential to the bearing 98 at the part 102. The resulting torque urges the door toward the closed position and the torque remains even after the door is closed because the spring rod 120 still contacts only the part 102, rather than the entire flat surface 100. Hence, the force of the spring rod 120 continues to act to one side of the pivot pin 94 and the door is urged past a closed position. As with the hinge of FIGS. 1-5, the hinge 78 is preferably arranged so that the door would ordinarily move, if not restricted by the frame member 74, to a position approximately 3° (FIG. 8) beyond the closed position, although any angle from 2° to a least 10° is suitable.

Referring to the modification of FIGS. 10-13, a cabinet 122 includes side walls 124, a hinge frame member 126, and a door stop frame member 128 having a door bumper 130. A door 132 again is of the overlay type and is pivotally attached to the hinge frame member 126 by a hinge 134. The hinge 134 includes a first portion 136 and a second portion 138 which are pivotally connected. The first portion 136 includes a back plate 140 having openings 142 to receive screws 144 for fastening the portion 136 to the inner surface of the frame member 126, in this instance. The back plate 140 also forms a groove 146 (FIG. 14) which receives a spring rod 148 having a loop 150 affixed to the plate 140 by a rivet 152. The groove 146 enables the rod 148 to be flush with the back surface of the plate 140 so that the plate 140 can fit flush against the hinge frame member 126. The back plate 140 also has an out-turned flange 154, part of which is bent outwardly to provide a plate extension 156. The end of the extension 156 has an opening 158 (FIG. 12) which receives a pivot rivet 160 similar to the rivet 94.

The hinge portion 138 includes a back plate 162 having elongated openings 164 to receive screws 166 to affix the back plate 162 to the inner surface of the door 132. The plate 162 also has an extension 168 bent therefrom with an opening 170 (FIG. 13) to receive a non-circular projection 172 of a sleeve bearing 174 to prevent rotation of the bearing 174 relative to the hinge portion 138. The bearing 174 lies between the extensions 156 and 168; it also is of an oily plastic material and has a flat surface 176 and an edge or engageable part 178. The spring rod 148 extends beyond the back plate 140 and is bent to one side so that it bears against the bearing 174 at all times and the bearing 174 holds it in a sprung position displaced from its normal unsprung position.

When the door 132 is open, as shown in FIGS. 11 and 12, the spring rod 148 contacts the arcuate surface of the bearing 174 and has no appreciable effect on the opening and closing of the door. However, when the door is moved toward the closed position and reaches an angle of roughly 25°-30° to the front plane of the cabinet 122, the spring rod 148 contacts the part 178 of the bearing 174. As the outer portion of the spring rod 148 moves beyond a position tangential to the bearing 174 at the part 178, the force of the spring rod is directed to one side of the pivot pin 160, thereby producing a torque tending to move the door 132 beyond the closed position.

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Again, this force would be exerted until the door would reach a position about 3° beyond the closed one, with a position anywhere from 2° to at least 10° beyond the closed position being satisfactory.

Various modifications of the above described embodiments of the invention will be apparent to those skilled in the art, and it is to be understood that such modifications can be made without departing from the scope of the invention, if they are within the spirit and the tenor of the depending claims:

I claim:

1. A hinge to pivotally connect a door to a frame so that the door will close tightly without a latch, said hinge comprising a first portion and a second portion, a hinge pin pivotally connecting said first and second portions, said first portion including a hinge plate to receive a fastener for attaching said first portion to one of said frame and said door, two spaced hinge pin bearing sleeves extending from said hinge plate and receiving said hinge pin, said second hinge portion including a second hinge plate to receive a fastener for attaching said second portion to the other of said door and said frame, said second hinge portion having an intermediate hinge pin bearing sleeve receiving an intermediate portion of said hinge pin between said two bearing sleeves, said intermediate bearing sleeve having an arcuate surface and a recess forming an edge with said surface, spring means having end portions held by said first hinge portion and having an intermediate portion urged toward said intermediate bearing sleeve, a pressure member mounted on the intermediate portion of said spring means, said pressure member being urged against said arcuate surface of said intermediate bearing sleeve for all open positions of said door, said spring means and said engageable edge being positioned such that said pressure member moves beyond said edge and partially into said recess as said second hinge portion is moved to a closed position, whereby said pressure member is urged by said spring means against said edge of said second hinge portion to bias said door beyond the closed position.

2. A hinge to pivotally connect a door to a frame so that the door will close tightly without a latch, said hinge comprising a first portion and a second portion, a hinge pin pivotally connecting said first and second portions, said first portion including a hinge plate to receive a fastener for attaching said first portion to one of said frame and said door, two spaced hinge pin bearing sleeves extending from said hinge plate and receiving said hinge pin, said second hinge portion including a second hinge plate to receive a fastener for attaching said second portion to the other of said door and said frame, said second hinge portion having an intermediate hinge pin bearing sleeve receiving an intermediate portion of said hinge pin between said two bearing sleeves, said intermediate bearing sleeve having an arcuate surface and a recess forming an edge with said surface, spring means held by said first hinge portion between said first hinge plate and said bearing sleeves whereby said spring means is partially hidden by said bearing sleeves, said spring means having an intermediate portion urged toward said intermediate bearing sleeve, said spring means lying in a plane generally parallel to said hinge pin, a pressure member mounted on the intermediate portion of said spring means, said pressure member being urged against said arcuate surface of said intermediate bearing sleeve for all open positions of said door, said spring means and said edge being positioned such that said pressure member moves

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beyond said edge and partially into said recess as said second hinge portion is moved to the closed position, whereby said pressure member is urged by said spring means against said edge of said second hinge portion to bias said door beyond the closed position.

3. A cabinet hinge to pivotally connect a cabinet door to a frame defining an access opening into the cabinet, said hinge comprising a first portion and a second portion, a hinge pin pivotally connecting said first portion and said second portion, said first portion including a hinge plate to be fastened to one of said door and said cabinet frame, a first bearing sleeve extending from said hinge plate through which said hinge pin extends, said second hinge portion including a second hinge plate to be fastened to one of said door and said cabinet frame, said second portion including a second bearing sleeve to receive the hinge pin and contiguous with said first bearing sleeve, said second bearing sleeve including engageable means, a heavy spring, means on said first hinge portion for holding end portions of said spring in a manner to urge an intermediate portion of said spring toward said second bearing sleeve and toward said engageable means, a cylindrical pressure member mounted on said intermediate portion of said spring, said cylindrical pressure member being pressed against said second bearing sleeve when said cabinet door is open and pressed against said engageable means by said spring to bias said cabinet door beyond the closed position when in the closed position.

4. A cabinet hinge to pivotally connect a cabinet door to a frame defining an access opening into the cabinet, said hinge comprising a first portion and a second portion, a hinge pin pivotally connecting said first portion and said second portion, said first portion including a hinge plate to be fastened to one of said door and said cabinet frame, a first bearing sleeve extending from said hinge plate through which said hinge pin extends, said second hinge portion including a second hinge plate to be fastened to one of said door and said cabinet frame, said second portion including a second bearing sleeve to receive the hinge pin and contiguous with said first bearing sleeve, said second bearing sleeve including engageable means, a heavy wire spring lying in a plane parallel to said hinge pin, means on said first hinge portion for holding end portions of said spring in a manner to urge an intermediate portion of said spring toward said second bearing sleeve and toward said engageable means, a plastic pressure member mounted on said intermediate portion of said spring and urged against said second bearing portion for all positions of the door, said pressure member being pressed against said engageable means by said spring to bias said cabinet door beyond the closed position when in the closed position.

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