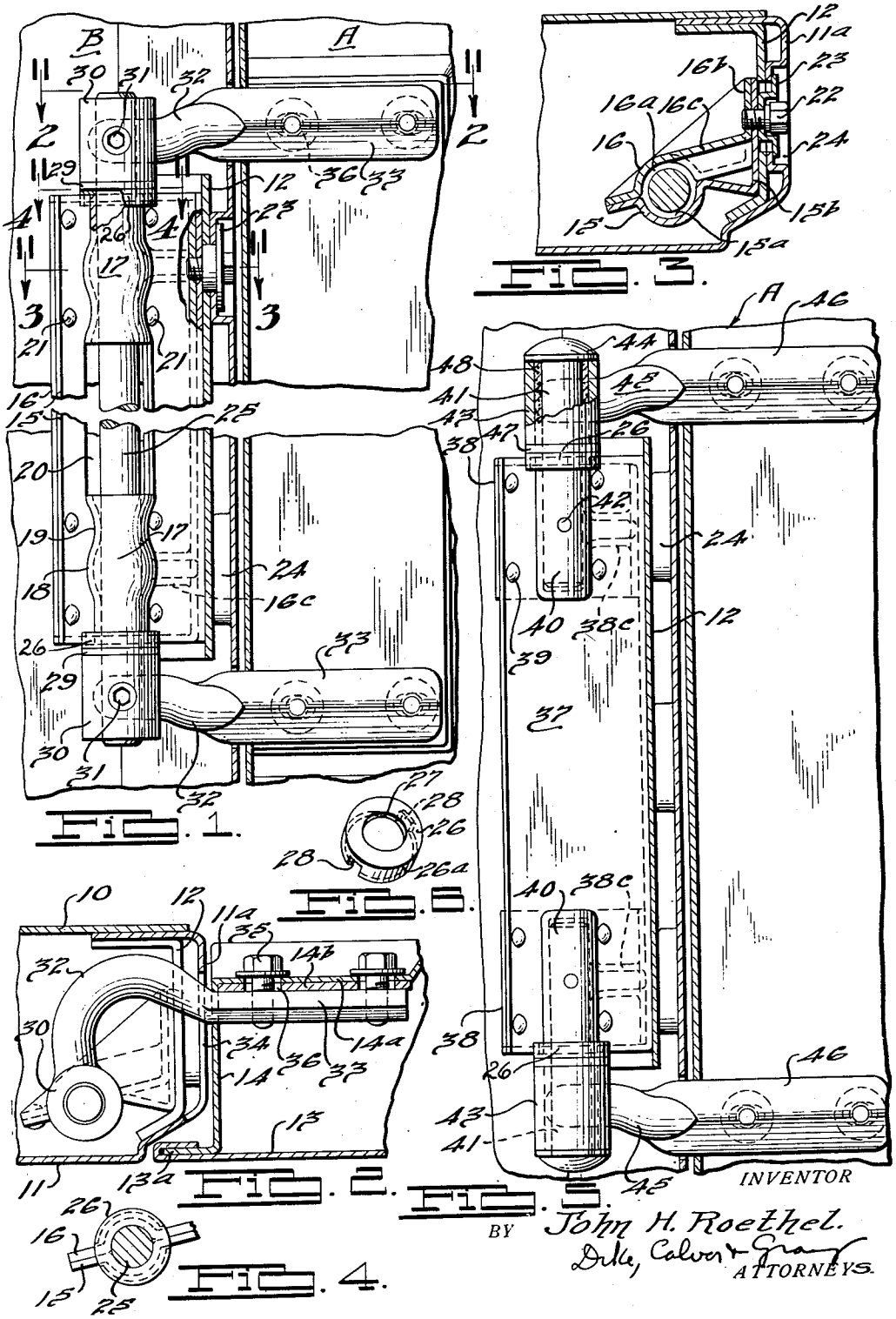
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CONCEALED HINGE

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INVENTOR

BY John H. Roethel.

Dike, Calvert & Gray

ATTORNEYS.

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CONCEALED HINGE

John H. Roethel, Detroit, Mich., assignor to Marvel Equipment Corporation, Detroit, Mich., a corporation of Michigan

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This invention relates to hinges and more particularly to concealed hinges for doors as well as various types of closures. The invention is especially, although by no means exclusively, adapted for utilization in connection with the hinging of vehicle doors, particularly the doors of automobile bodies, and as will be seen from a consideration of the embodiments herein exemplified the invention is susceptible of wide application or adaptation.

An object of the invention is to simplify and improve the hinge mountings for swinging closures, such as automobile doors or doors of other types of vehicles or of non-vehicular structures, and to provide in a unitary hinge device a simple, efficient, sturdy, compact and practicable means for hingedly supporting the door or closure.

A further object of the invention is to provide an improved hinge device for a swinging closure, particularly for doors of substantial height, such as vehicle doors, which is so constructed and simplified as to enable a single relatively inexpensive unitary hinge device made in accordance with the invention to supplant a plurality of separate or distinct hinge devices heretofore resorted to for hingedly supporting the door or closure.

Another object of the invention is to provide an improved double hinge construction for a swinging closure, particularly for vehicle doors, such as the doors of automobiles, wherein the upper and lower hinge members are provided with a unitary mounting means or member which at all times maintains the axes of turning of the hinges in proper alinement and which at the same time provides a common means for mounting the hinges in one operation upon the body or pillar or other support for the swinging closure or door.

Still another object of the invention is to provide an improved unit-type concealed hinge adapted to provide a single unitary means for swingingly mounting the door or closure upon the supporting frame thereof, the improved hinge device being of materially less height than the door yet providing ample bearing support for the door.

Still another object of the invention is to provide a unitary concealed hinge device for a vehicle door, particularly an automobile door, of outwardly bowed or curved contour, the device providing a single hinge unit for the door of sturdy, durable construction, which may be more easily, quickly and cheaply installed and which may be readily and simply adjusted to properly line up or position the door in the door opening.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a fragmentary vertical section illustrating portions of an automobile door and its supporting pillar with a hinge device, constructed in accordance with one embodiment of the invention, mounted thereon for swingingly supporting the door.

Fig. 2 is a section taken substantially through lines 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a section taken substantially through lines 3—3 of Fig. 1 looking in the direction of the arrows.

Fig. 4 is a section taken substantially through lines 4—4 of Fig. 1 looking in the direction of the arrows.

Fig. 5 is a view similar to Fig. 1 illustrating another embodiment of the invention.

Fig. 6 is a perspective view of the bearing cap used in both of the embodiments of Figs. 1 and 5.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the drawing there is illustrated, by way of example, a hinge device constructed in accordance with two embodiments of the invention as applied to the swinging closure or door A of an automobile body B, the latter, however, being illustrative of but one application of the invention. Referring to Figs. 1 to 5 inclusive, the hinge device of each embodiment comprises a fixed hinge member and a movable hinge member, the fixed hinge member being carried by the body and the movable hinge member, cooperating therewith, being secured to the door or closure. As is customary the swinging door swings into and out of the door opening defined

by a suitable door frame, the upright portion of the frame to which the door is hinged being of reinforced nature and commonly termed a pillar or post. As illustrated in Fig. 2 the marginal upright edge of the door opening which forms the pillar upon which the hinge is supported is formed between inner and outer pressed metal body panels 10 and 11, the outer panel 11 being flanged in to provide an upright jamb 11a and secured to the inner panel 10 as by spot welding. A reinforcing upright channel member 12 may be spot welded to the side portions of the jamb member 11a. The door B may comprise an outer pressed metal door panel 13 and an inner upright pressed metal panel 14 suitably secured at 13a to the outer panel and flanged to provide an upright structural pillar member forming a jamb facing the body jamb 11a.

The fixed hinge member, as also the major portion of the movable hinge member, is concealed within the hollow body pillar or post behind the jamb 11a. In the present instance the fixed hinge member of the embodiment of Fig. 1 comprises two mating plates 15 and 16 of pressed steel which are positioned face to face and rigidly fastened together. As herein illustrated these plates are pressed or stamped to provide spaced upper and lower complemental and identical longitudinally extending grooves or generally concave channels 15a and 16a which face each other, when the plates are positioned together, to provide conjointly a pair of vertically spaced bores or bearing sockets 17. Although for convenience two separate hinge plates 15 and 16 are shown it will be understood that a single plate may be used and pressed with the grooves 15a and 16a after which the plate is bent to fold one portion back upon the other to provide the spaced bores 17. The complemental grooves or channels 15a and 16a on the hinge plates are preferably corrugated in their length to provide alternate outwardly and inwardly extending curved ribs 18 and 19.

As illustrated in Fig. 1, the bores or bearing sockets 17 are spaced apart at 20, within which area the metal of the plates may be cut away or removed. The hinge plates 15 and 16 are placed together face to face and secured together in any suitable manner, such as by rivets 21. The body portions of the hinge plates extend in a plane longitudinally of the door A and body pillar B and for the purpose of mounting these plates they are provided with generally right angle transverse flanges 15b and 16b which extend face to face of the intermediate web of the reinforcing channel 12. These flanges are secured to the channel 12 and also to the jamb member 11a by screws or bolts or the like 22 and intervening countersunk clinch washers 23 which are housed within countersunk depressions 24 pressed into the face of the jamb 11a, see Fig. 3.

The movable hinge member of the embodiment of Fig. 1 comprises a cylindrical shaft or rod 25 providing a pintle member which extends vertically through the bearing sockets or bore portions 17. The vertical pintle member or spindle 25 has a bearing within the socket portion 17 only at the separated points 19, being spaced from the outwardly embossed portions 18 of the bores. This construction reduces to a minimum the friction of the shaft 25 within the bearing sockets 17 while at the same time providing an adequate support for the shaft. In addition, the spaces between the embossed portions 18 and the shaft 25 are utilized to hold and retain a supply of lubricating material, such as grease or graphite, for constantly lubricating the hinge.

The upper and lower end of each bearing socket 17 is capped by means of a bearing cup 26. Each cap is cup-shaped and provided with a hole 27 through which the shaft or spindle 25 extends. The annular flange 26a of the cap has diametrically opposed notches 28 within which extend the upper or lower edges of the hinge plates 15 and 16 at opposite sides of the socket. Thus, the cap 26 fits over the end of the socket or bore 17 and is interlocked therewith against rotation. Bearing against the end face of each bearing cap 26 is a flat washer 29 which may be formed of an oil bearing metal or any other suitable metal. Engaging the face of each washer 29 is a sleeve 30 which is pinned at 31 to an end of the shaft or spindle 25 so as to rotate therewith. Each sleeve 30 fits snugly over the end of the shaft and formed integrally with the sleeve is a crank arm portion 32 which has a gooseneck portion and a straight flattened extension 33 extending through a transverse horizontal slot 34 in the jamb 11a. The extension 33 bears against the inner face of an embossed portion 14a of the door panel 14 and is adjustably secured thereto by means of bolts or screws 35 extending through elongated horizontal slots 36 in the embossing 14a. As shown in Fig. 2 a reinforcing plate 14b may be interposed between the panel portion 14a and the flat faced extensions 33 of the arms 32.

From the foregoing it will be seen that when the door A is swung outwardly the arms 32 of the hinge will swing laterally within the slots 34 and this movement will turn or rotate the shaft or spindle 25 within the short bearing portions 17. The sleeve portions 30 will be supported by the end bearing caps 26 which are held, as above described, against rotation. If desired the washers 29 may be omitted and the sleeves 30 caused to engage directly against the end faces of the bearing caps 26.

Referring to the embodiment illustrated in Fig. 5, in this instance the fixed hinge member comprises a single relatively long hinge plate 37, substantially similar to the hinge plate 15, and two upper and lower relatively short hinge plates 38 which in cross-section are similar to the hinge plate 16. The long hinge plate 37 and each of the shorter hinge plates 38 are pressed or stamped to provide opposed mating grooves or channels which together form upper and lower cylindrical bearing sockets or bore portions 40. The construction of each of the socket or bore portions 40 is substantially the same as the socket portions 17 with the exception that each bore 40 is cylindrical from end to end and is not corrugated as in the previous embodiment. The hinge plates 37 and 38 may be secured together as by means of rivets 39. Extending vertically into each bore or socket portion 40 is a cylindrical pintle pin 41, each pin extending beyond an end of the hinge plates and being pinned or otherwise secured at 42 within the socket against rotation. Embracing the projecting end of each pin 41 is a cylindrical sleeve 43 which is rotatable thereon. Each pintle pin 41 has a head 44 provided with a flat bottom face overlapping and engaging the end of the sleeve 43. Extended integrally from the sleeve 43 is an arm 45, similar to the arm 32, which has a flattened extension 46 adjustably secured to the door A in the same manner as illustrated in Fig. 2.

The outer end of each bore or socket portion 40 is closed or capped by means of a bearing cap

26 in the same manner as previously described, which cap is interposed between the sleeve 43 and the end of the socket 40. If desired a flat washer 47 of oil bearing metal may be interposed between the sleeve 43 and the bearing cap 26. Also, if desired, a cylindrical bushing 48 of oil bearing metal may be interposed between the sleeve 43 and the pintle pin 41. However, the parts 47 and 48 may be omitted and the sleeve 43 formed, as will be readily understood, to bear directly upon the pintle pin 41 and upon the face of the bearing cap 26.

From the foregoing it will be seen that the spaced pintle pins 41 are fixed against rotation with respect to the fixed hinge member 37, 38, and the arms 45 with their integral bearing sleeves 43 are mounted to turn or rotate upon the pins and against the bearing caps at the outer ends of the socket portions 40. The hinge pins 41 are always maintained in exact alinement by virtue of the unitary hinge plate 37 connecting them together and at all times maintaining the same in alinement. Thus, the hinge may be installed in one operation and with a minimum of labor since no effort is required to line up the upper and lower hinges. It will be understood that the hinge unit of Fig. 5 is supported and mounted in the same manner as above described in connection with Figs. 2 and 3 and as shown therein. Installation of the hinges of both embodiments of this invention is facilitated by reason of the adjustable mounting of the arm extensions 33 and 46 and also by reason of the adjustable mounting of the hinge plates to the jamb 11a through the screws 22 and adjustable lock washers 23. To increase the rigidity and strength of the hinge the hinge plate 16 and each of the hinge plates 38 are ribbed or embossed at 16c and 38c, respectively, at points opposite the attaching devices 22.

Another important feature of the invention resides in the concealment within the hollow door and body pillars of substantially all portions of the hinge members and particularly the mounting portions of both the fixed and movable hinge members. Not only are these portions fully concealed but the improved construction in this respect facilitates and simplifies the assembly of the door on the assembly line. It will be noted that in the assembly of an automobile body utilizing concealed hinges in accordance with the invention the entire hinge unit is inserted into the pillar 10—11 from the rear side thereof, the arms 33 or 46 being passed through the slots 34, and the fixed hinge member secured to the jamb 11a and the reinforcing channel 12 by means of the screws 22, the heads of which are accessible at the outer face of the jamb. The door A may be readily installed at a later stage on the assembly line simply by passing the arms 33 through correspondingly shaped holes in the door jamb 14, after which the arms are rigidly fastened to the inner side of the door pillar at right angles to the jamb 14 by the screws 35 entering tapped holes in the arm extensions 33. This may be readily accomplished since the screws 35 are accessible at the inner face of the door frame. Thus, the door may be hung without difficulty on the assembly line even though the entire hinge has previously been installed within the body pillar and behind the jamb thereof.

I claim:

1. In a concealed hinge, a fixed hinge member comprising a pair of metal plates secured together in opposed relation, said plates having complementary depressed portions arranged to provide an upright bore between said plates, an upright hinge pin extending into said bore and fixed against rotation, a laterally extending arm having a sleeve rotatable on said pin, and a non-rotatable inverted cup-shaped bearing cap interposed between the sleeve and the edges of said plates.

2. In a concealed hinge, a fixed hinge member comprising a pair of metal plates secured together in opposed relation, said plates having complementary depressed portions arranged to provide an upright bore between said plates, an upright hinge pin extending into said bore, an arm extending laterally from said pin and having a sleeve embracing the same, and a non-rotatable inverted cup-shaped bearing cap interposed between the sleeve and the edges of said plates.

3. In a concealed hinge, a pressed metal fixed hinge member having an upright bearing socket normally open at one end, a hinge pin mounted in said socket and projecting beyond the open end thereof, a rotatable sleeve on said projecting end of the pin, an arm extending laterally from the pin, and a bearing cap interposed between the sleeve and the open end of the bearing socket in nonrotatable relation to the socket.

4. In a concealed hinge, a fixed hinge member comprising a pair of opposed plates secured together, said plates having complementary depressed portions arranged to provide an upright bore between said plates, a rotatable hinge pin extending through said bore, the walls of said bore being provided with a series of concavo-convex corrugations forming spaced points of contact with the pin, said corrugations being adapted to retain lubricating material for constant lubrication of said hinge, and a laterally extending arm fastened to one end of the pin and adapted to be secured to a swinging closure.

5. In a concealed hinge, a fixed hinge member comprising a pair of opposed plates secured together, said plates having complementary depressed portions arranged to provide an upright bore between said plates, a rotatable hinge pin extending through said bore, the walls of said bore being provided with a series of concavo-convex corrugations forming spaced points of contact with the pin, said corrugations being adapted to retain lubricating material for constant lubrication of said hinge, and a laterally extending arm fastened to each end of the pin and adapted to be secured to a swinging closure.

6. In a concealed hinge, a fixed hinge member comprising a relatively long plate and a relatively short plate secured to each end of the long gether said plates having complementary depressed portions arranged to provide spaced alined bores between said plates, a hinge pin mounted in each bore, a rotatable sleeve on each pin, and a swinging arm extending laterally from each sleeve for securement to a swinging door.

7. In a concealed hinge, a fixed hinge member comprising a relatively long plate and a relatively short plate secured to each end of the long plate, said plates having complementary depressed portions arranged to provide spaced alined bores between said plates, a hinge pin mounted against rotation in each bore, a rotatable sleeve on each pin, and a swinging arm extending laterally from each sleeve for securement to a swinging door.

8. In a concealed hinge, a fixed hinge member

comprising a relatively long plate and a relatively short plate secured to each end of the long plate, said plates having complementary depressed portions arranged to provide spaced alined bores between said plates, a hinge pin mounted in each bore, a rotatable sleeve on each pin, and a swinging arm extending laterally from each sleeve for securement to a swinging door, said pin having a thrust bearing overlying the outer end of the sleeve, and a non-rotatable bearing piece interposed between the sleeve and the edges of the adjacent plate members.

9. In a concealed hinge, a fixed hinge member comprising a relatively long plate and a relatively short plate secured to each end of the long plate, said plates having complementary depressed portions arranged to provide spaced alined bores between said plates, a hinge pin mounted against rotation in each bore, a rotatable sleeve on each pin, and a swinging arm extending laterally and integrally from each sleeve for securement to a swinging door, said arms terminating in substantially straight parallel flattened extensions adapted to be secured to a swinging door.

10. In a concealed hinge, a fixed hinge member comprising two vertically spaced pairs of plate sections secured together in opposed relation, said plate sections each having complementary depressed portions to provide an open ended bore for each of said pairs, means for connecting said pairs together to maintain the bores in alinement and to permit attachment of the fixed hinge member as a unit to a support, a hinge pin secured in each bore and extending a distance out of the bore, a rotatable sleeve on the extended end of each pin, an arm secured to each sleeve and extending laterally therefrom, each pin having a thrust bearing overlying the end of the sleeve, and a non-rotatable bearing piece interposed between each sleeve and the fixed hinge member.

JOHN H. ROETHEL.

CERTIFICATE OF CORRECTION.

Patent No. 2,255,534. September 9, 1941.

JOHN H. ROETHEL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 59, claim 6, strike out "gether" and insert instead the word and comma --plate,--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of November, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)