Oct. 29, 1940. R. I. SCHONITZER 2,219,825

DOOR HINGE AND DOOR OPENING MEANS

Filed Feb. 28, 1940 2 Sheets-Sheet 1

FIG. 1

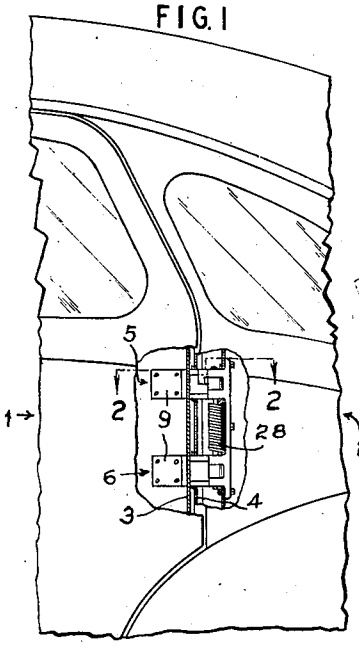


FIG. 2

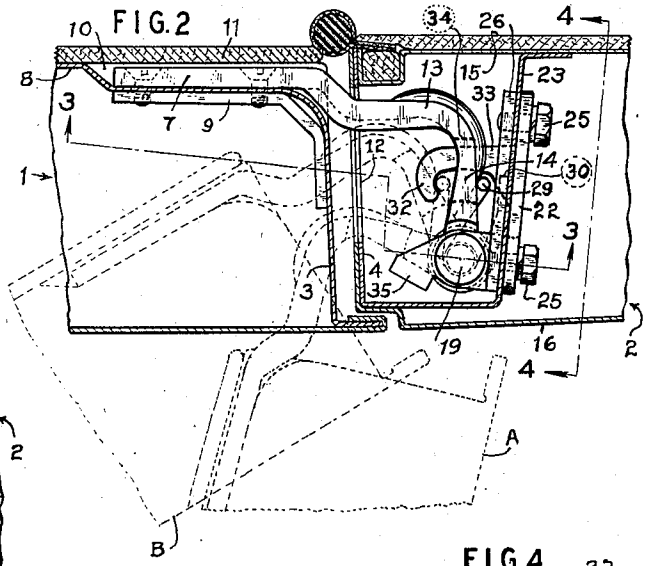


FIG. 3

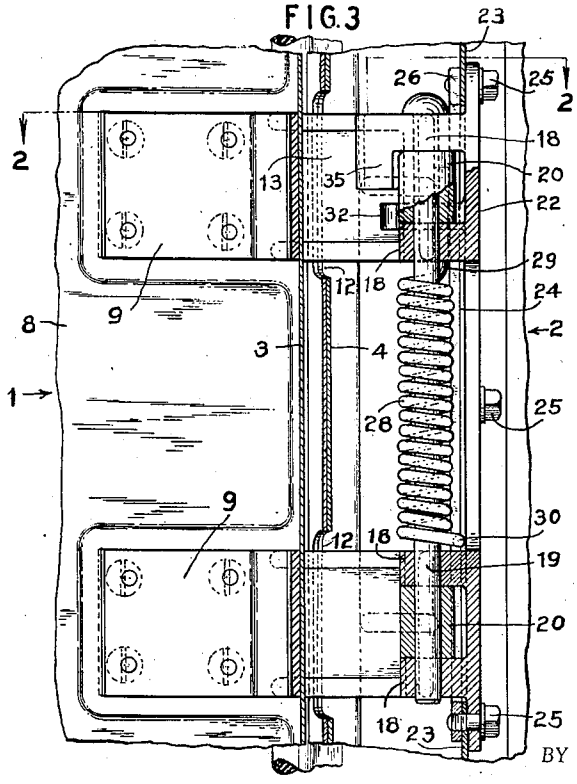
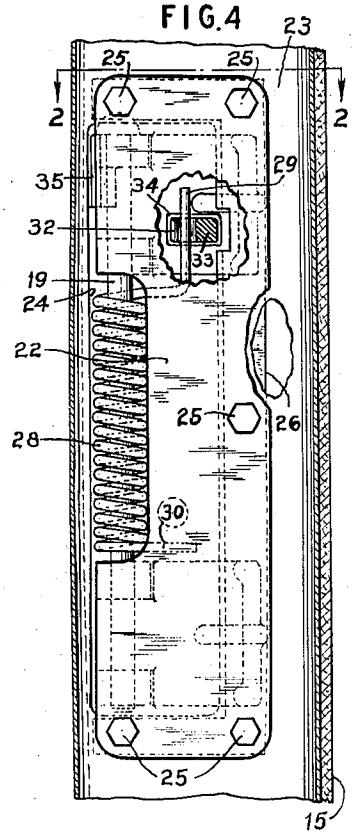


FIG. 4



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Filed Feb. 28, 1940 2 Sheets-Sheet 2

FIG. 5

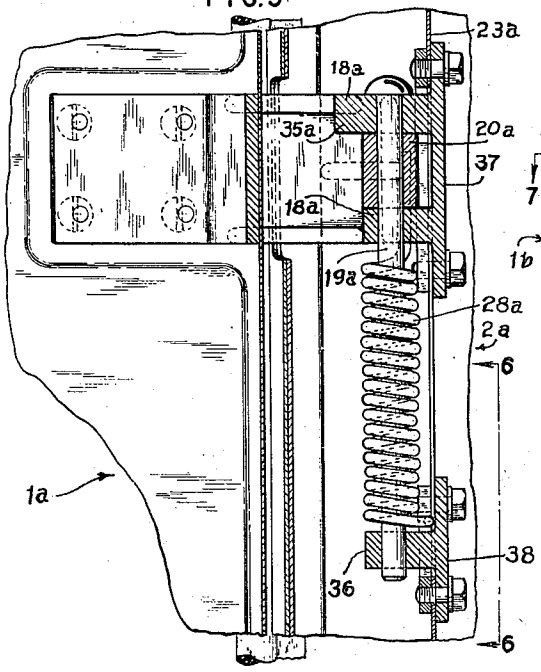


FIG. 8

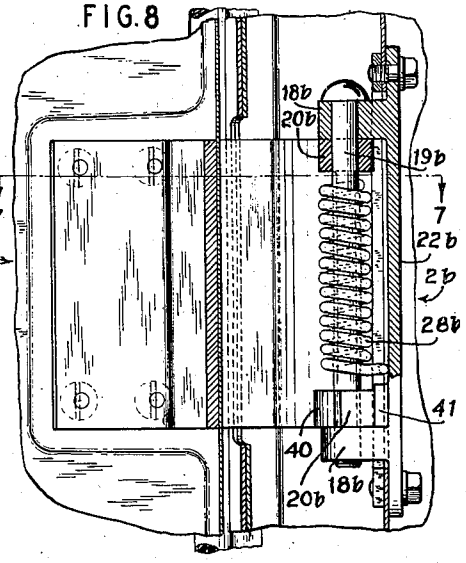


FIG. 6

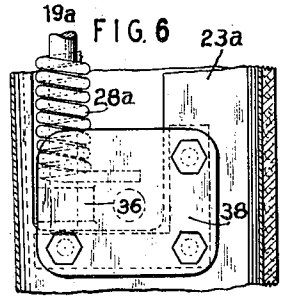


FIG. 9

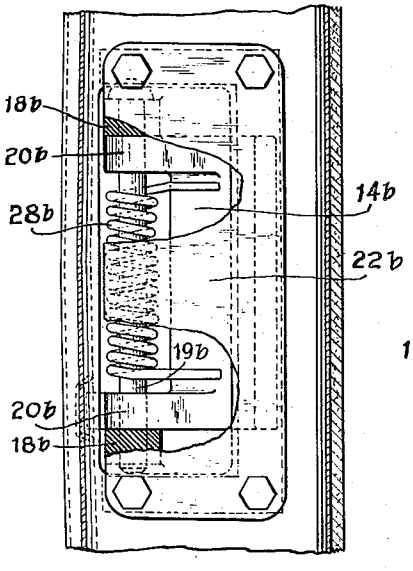
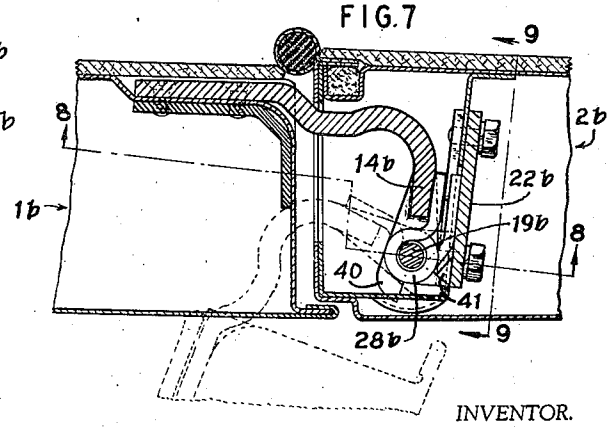


FIG. 7



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UNITED STATES PATENT OFFICE

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DOOR HINGE AND DOOR OPENING MEANS

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Application February 28, 1940, Serial No. 321,259

9 Claims. (Cl. 16—189)

This invention relates to door hinge and door opening means, the hinge of such means being of the concealed type. Although not restricted thereto, means embodying the present invention are particularly applicable for use with present-day automobile doors, as will hereinafter more fully appear.

The present invention has for its general object the provision of means by which an automobile door or the like can be hinged on its supporting structure and by which said door can be automatically opened upon the unlatching thereof, the hinging of said door and the automatic opening thereof being accomplished in a particularly practical and effective manner.

Another object of the present invention is the provision of means which not only enables an automobile door or the like to be hinged on its supporting structure and to be automatically opened upon the unlatching thereof, but which also yieldingly resists (but only to a desirable degree) the closing of said door from the predetermined position to which it is automatically opened.

As will hereinafter appear, the predetermined open position to which a door is automatically movable by means embodying the present invention may be the fully open position of said door, as in those embodiments of the invention illustrated in Figs. 5 to 9 inclusive; or the predetermined open position to which a door is automatically movable by means embodying the present invention may be a partially open position of said door, as in that embodiment of the invention illustrated in Figs. I to 4 inclusive, in which case said door may be manually moved to it fully open position from such partially open position; all as will be readily understood.

Another object of the present invention is the provision of means which not only enables an automobile door or the like to be hinged on its supporting structure and to be automatically opened upon the unlatching thereof, but which also arrests the opening movement of said door when it reaches its fully open position.

Another object of the present invention is the provision of door hinge and door opening means which can be assembled as a unit, and hence in a simple and convenient manner, with a door or its supporting structure.

Another object of the present invention is the provision of door hinge and door opening means having a hinge leaf which, in the use of said means with a door structure and its supporting structure, is rigidly secured to one of said structures and extends into the other structure for pivotal association therewith; and which means does not require, in the structure into which said hinge leaf extends, the provision of large or objectionable openings or the like, all as will hereinafter more fully appear.

Other features of the three door hinge and door opening means here illustrated are their structural simplicity, which keeps their cost low; their strong and rugged character, which enables them to have an exceedingly long life in service, without requiring attention from time to time; and the efficiency with which they perform their several functions, such as their door hinging function, their door opening function, their function of arresting the opening movement of the doors with which they are used when said doors reach their fully open positions; and their function of yieldingly resisting the closing of such doors from the predetermined open positions to which said doors are automatically movable.

Further features of door hinge and door opening means embodying the present invention are in part obvious and in part will appear from the following description of three such means, reference being had to the accompaying drawings, in which

Fig. 1 is an outside elevation of a left rear automobile door and an adjacent portion of the automobile body on which said door is hinged by one form of door hinge and door opening means embodying the present invention, parts of the outer side walls of said door and body portions being broken away to expose such means and said door being in its closed position; Fig. 2 is a horizontal sectional view, on an enlarged scale, through said door and body portions, the view being on the line 2—2, Figs. 1 and 3, and two open positions of said door being indicated in dotted lines, namely, the predetermined partially open position to which said door is automatically movable and the fully open position to which said door is manually movable from such partially open position; Fig. 3 is a vertical sectional view through said door and body portions, on the line 3—3, Fig. 2, but on a slightly reduced scale; Fig. 4 is a vertical sectional view through said body portion, the view being on the line 4—4, Fig. 2, and on the scale of Fig. 3; Fig. 5 is a view similar to Fig. 3 and illustrating a slightly modified form of door hinge and door opening means embodying the present invention; Fig. 6 is a detail vertical sectional view through the automobile body portion of Fig. 5, as viewed from the line 6—6, Fig. 5; Fig. 7 is a view similar

to Fig. 2 but showing still another form of door hinge and door opening means embodying the present invention, the view being on the line 7—7, Fig. 8, and the fully open position of said door, to which it is automatically movable, being indicated in dotted lines; Fig. 8 is a vertical sectional view through the automobile door and body portions of Fig. 7, the view being on the line 8—8, Fig. 7; and Fig. 9 is a vertical sectional view through the automobile body portion of Figs. 7 and 8, the view being on the line 9—9, Fig. 7.

Before the present invention is described in detail, it is to be understood that such invention is not limited to the details of construction or the specific arrangement of parts herein illustrated or described, as the invention obviously may take other forms. It also is to be understood that the phraseology or terminology herein employed is for the purpose of description and not of limitation.

Although door hinge and door opening means embodying the present invention are applicable for use with the doors of various structures, said means are particularly useful with the doors of present-day automobiles, and for purposes of illustration and not of limitation, the use of three such door hinge and door opening means with present-day automobile doors is here shown and described.

Referring first to Figs. 1 to 4 inclusive, wherein is illustrated one form of door hinge and door opening means embodying the present invention, the reference numeral 1 designates a portion of a left rear automobile door, the rear edge portion of which is hinged, as is usual, on the front edge part of that portion of the automobile body here shown and designated generally by the reference numeral 2, the hinging (in a concealed manner) of said door on said body portion being effected by the hinge parts of such door hinge and door opening means, as will hereinafter more fully appear. As best shown in Fig. 2, when the door 1 is in its closed position, the transverse rear edge wall 3 of said door and the transverse front edge wall 4 of the body portion 2 (which edge walls are hereinafter termed "hinge edge walls") are in oppositely positioned or generally abutting relationship, by which is meant that said hinge edge walls are oppositely positioned or disposed and either in actual contact or, as here shown, relatively close to each other.

Although any suitable means may be utilized for releasably retaining the door 1 in its closed position and for actuating said retaining means to release said door for opening movement, (said retaining means being hereinafter referred to broadly as "latch means"), the door hinge and door opening means here involved are particularly useful in conjunction with doors whose latch means have push-buttons or the like for effecting release actuation thereof, as said door hinge and door opening means automatically effect the opening of such doors upon the unlatching thereof. Projecting door handles, by the use of which present-day automobile doors are unlatched and manually opened, not only are dangerous (in that many severe injuries have been caused by them) but also, said projecting handles seriously interfere with the streamlining effects now desired for automobile bodies. Inasmuch as the door hinge and door opening means here involved automatically effect, upon the unlatching of the doors with which they are used, the movement of said doors to any desired open positions, including their fully open positions, the use for such doors of the present-day handles for door opening purposes is wholly unnecessary. As a result, simple push-buttons or the like, desirable from many standpoints, may be used with the latch means of a door with which is used a door hinge and door opening means embodying the present invention.

The latch means, therefore, of the automobile door 1 may be, and preferably is, of the type in which push-buttons or the like are utilized for effecting the release actuation of said latch means. For example, said latch means may be of the form disclosed in my copending application for Door opening devices, filed August 21, 1939, Serial No. 291,240, or in other words, latch means embodying the invention of my prior Patent No. 2,094,413 for Door control mechanism, to which patent reference may be had, if desired. However, inasmuch as the latch means of the door 1 forms no part of the present invention, no latch means for such door is here shown or described.

As will hereinafter more fully appear, each of the three door hinge and door opening means here illustrated is of such compact form that it may be, and here is, located between or within the confines of the general planes of the inner and outer surfaces, respectively, of the inner and outer side walls of an automobile door and the general planes of the inner and outer surfaces, respectively, of the inner and outer side walls of that portion of the automobile body on which said door is hinged, there being (see Figs. 2 and 7) more or less alignment of the outer side wall of such a door and the outer side wall of such a body portion and more or less alignment of the inner side wall of such a door and the inner side wall of such a body portion, when said door is in its closed position. The inner side wall of an automobile door and the inner side wall of the automobile body portion on which said door is hinged generally include trim panels or the like, and the "general plane" of the inner surface of such a side wall, as that term is here used, is the plane which not only includes the inner surface of the trim panel or the like of such wall but which also extends therebeyond, as will be readily understood.

As a result, each of the door hinge and door opening means here illustrated not only is eminently satisfactory from structural and functional standpoints but also, is commercially practical for a present-day automobile door, as such means is concealed from view when said door is in its closed position and is exposed when said door is in its fully open position, only to the extent to which a present-day automobile door hinge of the concealed type is now exposed. In other words, the door opening spring of such means is concealed from view at all times, and only a part of the movable hinge leaf or hinge leaves is exposed when said door is open.

Although door hinge and door opening means embodying the present invention may take various forms, as will be readily understood and as will hereinafter more fully appear, each of the three means here illustrated comprises (*a*) at least one hinge leaf secured to either a door structure or the supporting structure therefor and extending into the other structure; (*b*) at least one hinge eye carried by the structure into which said hinge leaf extends; (*c*) a pintle or the like for pivotally connecting said hinge leaf to said hinge eye, the result of which is the hinging, in a concealed manner, of said door struc-

ture on said supporting structure; and (*d*) spring means effective upon said hinge leaf for automatically opening said door structure upon the unlatching thereof, said spring means also having the function of yieldingly resisting (but only to a desirable degree) the closing of said door structure from the predetermined open position to which it is automatically movable, whereby said door structure, when opened, will be releasably retained in an open condition, even though it may have a normal tendency to close. In addition, a door hinge and door opening means embodying the present invention may include, as here shown, a suitable abutment for limiting the movement in a door opening direction of the hinge leaf of said means, and hence of the door structure secured to said hinge leaf, when said hinge leaf and said door structure reach their fully open position.

Referring now to the door hinge and door opening means illustrated in Figs. 1 to 4 inclusive, it will be noted that such hinge means includes a pair of hinge leaves 5 and 6 of the so-called goose neck form now frequently used in automobile door hinges of the concealed type, and which hinge leaves may be, and here are, of duplicate character for economy of manufacture and simplicity of assembly.

Although said hinge leaves may be rigidly secured to the automobile body portion 2 and pivotally associated with the automobile door 1, said hinge leaves are here rigidly secured to said automobile door, and for such securement purpose, each of said hinge leaves is provided with a generally flat end attaching portion 7. As here shown, the end attaching portions of said hinge leaves are rigidly secured to the sheet metal inner side wall member 8 of said door adjacent the hinge edge wall 3 thereof, and inasmuch as said door side wall member is of relatively light gauge metal, as is usual, the screws here used for securing such hinge leaf portions to said side wall member extend into a suitable tapping plate 9 with which such side wall member is here provided along its outer surface. As best shown in Fig. 2 the attaching portions of said hinge leaves extend alongside the inner surface of the door side wall member 8 and preferably, lie in suitable depressions or cavities 10 with which such side wall member is here provided, said attaching portions and the sheet metal side wall member 8 being covered by a suitable trim panel 11 which the inner side wall of the door 1 includes, as is usual.

Through suitable relatively small and wholly unobjectionable openings, such as the transversely disposed and vertically spaced slots 12, with which the hinge edge wall 4 of the automobile body portion 2 is provided, the vertically spaced and generally parallel hinge leaves 5 and 6 extend, the portions 13 and 14 of each such hinge leaf thereby located within said automobile body portion together constituting the so-called goose neck thereof. As best shown in Fig. 2, the portion 13 of each such hinge leaf is outwardly offset from, but generally parallel with, the attaching portion 7 thereof, and the portion 14 of each such hinge leaf is more or less normal to the inner and outer side walls 15 and 16 of said automobile body portion. Therefore, as the hinge edge wall 4 of said body portion is more or less normal to the inner and outer side walls thereof, and inasmuch as said body hinge edge wall is more or less parallel with the hinge edge wall 3 of the door 1 when said door is in its closed position, the transverse portion 14 of each such hinge leaf is more or less parallel at all times with the door hinge edge wall 3 and more or less parallel with the body hinge edge wall 4 when the door is in its closed position, all as clearly shown in Fig. 2.

For the pivotal connection of the transverse portions 14 of the two hinge leaves 5 and 6 to suitable hinge eyes 18 with which the automobile body portion 2 is here provided, a pintle 19 is here utilized, and for the reception of such pintle, a suitable aperture is provided in each of said hinge leaf portions. Preferably, the pintle-receiving aperture of each of said hinge leaf portions is at or adjacent the free or outer end thereof, and as here shown, each of said hinge leaf portions is provided at its free or outer end with a generally cylindrical apertured ear 20. If desired, the apertured ear of each hinge leaf may be of less height or depth than that of the portion 14 thereof by which it is carried or of which it is an integral part, and if such ear is of such reduced height or depth, it may be, and preferably is, spaced substantially midway between the upper and lower longitudinal edges of the portion 14, as here shown.

The hinge eyes 18 of the automobile body portion 2, to which the hinge leaf ears 20 are pivotally connected by the pintle 19, are here integral parts of a generally rectangular metal plate 22, which is located within said body portion and secured to any suitable part thereof. As here shown, said plate is screwed or otherwise suitably secured to the transverse wall 23 of a sheet metal reinforcement pillar with which such body portion is here provided, said plate lying alongside the rear surface of said pillar wall and having its hinge eyes 18 extending forwardly through a suitable opening 24 with which such pillar wall is here provided. Inasmuch as said pillar wall is of relatively light gauge sheet metal, as is usual, the attaching screws 25 for the plate 22 here extend into a generally C-shaped tapping plate 26 lying alongside the front surface of said pillar wall adjacent the inner side edge and the top and bottom edges of its opening 24, as clearly shown in Figs. 2, 3 and 4.

In this particular embodiment of the present invention, there are two pairs of hinge eyes 18 and the eyes of each such pair are spaced apart sufficiently to receive therebetween an apertured ear 20 of one of the hinge leaves 5 and 6. The pintle 19 extends, of course, through the two apertured ears of the two hinge leaves and through the four hinge eyes of the plate 22, and thus enables the automobile door 1 to be hinged, in a concealed and especially desirable manner, to the automobile body portion 2, all as will be readily understood.

In order to automatically effect the opening of the door 1, upon the unlatching thereof, the door hinge and door opening means of Figs. 1 to 4 inclusive is provided with or includes a helical torsion spring 28, which surrounds the pintle 19 between the two pairs of hinge eyes 18. As here shown, said spring is so wound that its upper end portion 29 has a normal tendency to swing in a door opening or counter-clockwise direction, Fig. 2, and such end portion therefore constitutes the door opening arm of said spring, as will hereinafter more fully appear. The lower end portion 30 of said spring has a normal tendency to move in a clockwise direction, Fig. 2, but such movement of said spring end portion is here effectively prevented by its engagement with

the plate 22 by which the hinge eyes 18 are carried, as clearly shown in Figs. 2 and 4.

As best shown in Fig. 2, the transverse portion 14 of the upper hinge leaf lies between the door 1 to be opened and the upper end portion or door opening arm 29 of the spring 28 and as said spring arm engages said hinge leaf portion from the rear, said spring arm has a normal tendency to push the upper hinge leaf, and hence the door 1, in a door opening direction. As a result, the automatic opening of the door 1 is accomplished in a particularly practical and effective manner, as will be readily understood.

During the closing of said door, the spring 28 is put in the desired "loaded" condition by the engagement of the transverse portion 14 of the upper hinge leaf 5 with the arm 29 of said spring, said spring arm being moved in a "spring loading" or clockwise direction, Fig. 2, during the closing of said door. Therefore, when said door is in its closed position, said spring is in proper condition to automatically effect, upon the unlatching of said door, the opening of said door, as will be readily understood.

If desired, the spring arm 29 may be permitted to swing, upon the unlatching of the door 1, a sufficient distance in a door opening or counter-clockwise direction, Fig. 2, to automatically effect the opening of said door to its fully open position, (the dotted line position of said door designated by the reference letter A in Fig. 1). As here shown, however, the position to which said door is automatically movable is a partially open position thereof, and for the accomplishment of that result, an abutment is here utilized for arresting the movement of the spring arm 29 in a door opening or counter-clockwise direction, Fig. 2, when said door reaches the desired partially open position, such as the dotted line position of said door designated by the reference letter B in Fig. 2. As will be readily understood, any suitable abutment may be utilized for cooperation with the spring arm 29 in limiting to the desired extent door opening movement thereof, the abutment here shown for such purpose being the out-turned end portion 32 of a hook-shaped arm 33 of the plate 22 by which the hinge eyes 18 are here carried. As best shown in Fig. 2, said hook-shaped arm projects forwardly from the plate 22, (of which it may be, if desired, an integral part) and inasmuch as said arm is here located in the path of movement of the upper hinge leaf 5, the transverse portion 14 of said hinge leaf is provided with a suitable slot 34 therefor, as clearly shown in Fig. 4.

As best shown in Fig. 2, when the door 1 reaches its partially open position shown in dotted lines, Fig. 2, and designated by the reference letter B, the out-turned end portion 32 of the plate arm 33 is engaged by the spring arm 29 and further movement of said spring arm, and hence further automatic movement of said door, in a door opening or counter-clockwise direction, Fig. 2, are effectively prevented, although said door may be manually moved, if desired, on to its fully open position, the dotted line position of said door designated by the reference letter A in Fig. 2. Therefore, by merely varying the location of the limiting abutment (such as the out-turned end portion 32 of the plate arm 33) for the door opening spring arm of means embodying the present invention, the door with which such means is used may be automatically moved to any desired partially open position, as will be readily understood.

In addition to effecting the automatic opening of the door 1, upon the unlatching thereof, the spring 28, through its arm 29, also yieldingly resists (but only to a desirable degree) the closing of said door from the predetermined partially open position to which it is automatically movable. As a result, said door, when opened, will remain in an open condition unless it is manually closed, even though said door, like most present-day automobile doors, has a normal tendency to close.

If desired, the door hinge and door opening means of Figs. 1 to 4 inclusive may effect, and it here does, the arresting of opening movement of the door 1 when it reaches its fully open position, thereby making wholly unnecessary the use of a separate door check for that purpose. As here shown, the uppermost hinge eye 18 of the automobile body portion 2 is provided, integrally or otherwise, with a depending abutment 35 in the path of door opening movement of the transverse portion 14 of the upper hinge leaf 5, the location of said abutment being such that it is engaged by said hinge leaf portion when the door 1 reaches its fully open position. The result of such engagement, of course, is the positive arresting of further opening movement of said door, and by merely varying the location of such abutment, the fully open position of said door may be readily predetermined, as desired.

As will be readily understood, the provision of either the abutment 32 for the spring arm 29 or the abutment 35 for the upper hinge leaf 5 serves to effectively limit the door opening movement of the spring arm 29 to such an extent that it is wholly unnecessary to wind up or load the spring 28, by hand or otherwise, when assembling the door hinge and door opening means of Figs. 1 to 4 inclusive with the automobile body portion 2, and inasmuch as said means is assembled as a unit with said body portion, such assembly can be easily, quickly and conveniently effected. Moreover, the assembly of such means with said body portion can be accomplished from within the automobile body, so that the openings 12 in the hinge edge wall 4 of the body portion 2 (through which the hinge leaves 5 and 6 extend) may be of small and wholly unobjectionable size.

For an automobile door of the character of the one designated by the reference numeral 1, the door hinge and door opening means of Figs. 1 to 4 inclusive is sufficient for the complete hinging of said door to its supporting structure, the hinge leaves 5 and 6 of said means being spaced apart sufficiently to make the hinging of said door by such means practical and effective. It is to be understood, however, that door hinge and door opening means embodying the present invention, (such as the means of Figs. 7 to 9, for example), may be used in conjunction with other hinges, such as those now on the market, if desired.

As heretofore pointed out, three forms of door hinge and door opening means embodying the present invention are here illustrated, and one such means, namely, the one illustrated in Figs. 1 to 4 inclusive, has now been specifically described. Reference will now be made to the other two, and to avoid needless repetition, only the manner in which they differ from the means of Figs. 1 to 4 inclusive will be referred to.

In the door hinge and door opening means of Figs. 5 and 6, there is but a single hinge leaf, the apertured ear 20a of which is located betwe n a

pair of hinge eyes 18a of the automobile body portion 2a. The hinge eye 36 of said body portion, through which extends the lower end portion of the pintle 19a, is not carried by the plate 37 of which the upper hinge eyes 18a are here integral parts, but is an integral part of a metal plate 38 which is screwed or otherwise suitably secured to the transverse wall 23a of the reinforcement pillar of said body portion. The helical torsion spring 28a of this door hinge and door opening means is therefore located between the hinge eye 36 and the lower hinge eye 18a, as clearly shown in Fig. 5. Although this embodiment of the present invention may effect, if desired, the automatic movement of the door 1a to a partially open position only (as in that embodiment of the invention illustrated in Figs. 1 to 4 inclusive), the means of Figs. 5 and 6 here effects the automatic movement of said door to its fully open position, as in the third form of the present invention here illustrated and about to be described. Inasmuch as the door hinge and door opening means of Figs. 5 and 6 is otherwise identical with the door hinge and door opening means of Figs. 1 to 4 inclusive, no further reference thereto is believed to be necessary.

In the door hinge and door opening means of Figs. 7 to 9 inclusive there is a single but somewhat wider or deeper hinge leaf, the transverse portion 14b of such hinge leaf having two apertured ears 20b at the free or outer end of said portion and adjacent the upper and lower longitudinal edges thereof. For the pivotal association of said hinge leaf therewith, the automobile body portion 2b is provided with two hinge eyes 18b, which are here shown as integral parts of a supporting plate 22b and which are spaced apart sufficiently to receive therebetween the upper and lower apertured ears 20b of said hinge leaf. The helical torsion spring 28b of this particular door hinge and door opening means is therefore located between the two hinge leaf ears 20b, said spring surrounding, as in the previously described embodiments of this invention, the pintle 19b which is utilized to pivotally connect said hinge leaf ears to the hinge eyes 18b of the automobile body portion 2b.

For arresting the opening movement of the automobile door 1b when said door reaches its fully open position, (the dotted line position of said door in Fig. 7) the lower hinge leaf ear 20b of the door hinge and door opening means of Figs. 7 to 9 inclusive is provided, integrally or otherwise, with an extension 40 for cooperative engagement, when said door reaches its fully open position, with an abutment 41 of the supporting plate 22b for the hinge eyes 18b, as clearly shown in Fig. 7. Inasmuch as the construction and operation of this particular door hinge and door opening means will be readily understood, no further reference thereto is believed to be necessary.

It is, of course, to be understood that the depending abutment 35 of the door hinge and door opening means of Figs. 1 to 4 inclusive and the corresponding abutment 35a of the door hinge and door opening means of Figs. 5 and 6, (fragmentarily shown in Fig. 5)—abutments for arresting the opening movement of the doors 1 and 1a—need not be carried by the upper hinge eyes of such means, but may be carried by other hinge eyes or by other parts of such means. Likewise, the inter-engageable parts 40 and 41 of the door hinge and door opening means of Figs. 7 to 9 inclusive, for arresting the opening movement of the door 1b when said door reaches its fully open position, may be other parts than those here shown.

As heretofore pointed out, the door hinge and door opening means of Figs. 1 to 4 inclusive is sufficient for the complete hinging on its supporting structure of a door of the character of the left rear automobile door designated by the reference numeral 1, as the movable hinge leaves 5 and 6 of such means may be spaced apart sufficiently to make the hinging of said door by such means practical and effective. However, for the complete hinging of some automobile doors, such as front doors and certain rear doors where more length is available for hinging purposes, more or less widely spaced hinge means are desirable, and for such a door, a door hinge and door opening means embodying the present invention may be used in conjunction with any suitable hinge means, such as with a hinge means of the type now on the market, or otherwise, as will be readily understood.

In the appended claims, therefore, the term "hinging" of a door structure on its supporting structure, and like or similar terms, denote and cover the pivotal connection of a door structure to its supporting structure, regardless of whether or not such pivotal connection is sufficient for the complete hinging of said door structure on its supporting structure.

Further features and advantages of the present invention will be readily apparent to those skilled in the art to which such invention relates.

What I claim is:

1. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to one of said structures and having a portion located within the other structure in the region of its hinge edge wall and between the general planes of its side walls, a part carried by and located within said last mentioned structure, a pintle pivotally connecting said hinge leaf portion to the aforesaid part of said last mentioned structure, whereby the door structure is hinged on said supporting structure, a torsion spring means having an arm effective on the aforesaid portion of said hinge leaf and normally urging said hinge leaf to swing in a door opening direction about the longitudinal axis of said pintle, said spring means being put in the desired loaded condition during the closing of the door structure and being effective to automatically open said door structure when it is closed and unlatched, and an abutment carried by the structure within which the aforesaid portion of said hinge leaf is located for so limiting the movement of said spring means arm in a door opening direction that said spring can effect the automatic movement of said door structure to a partially open position only.

2. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to one of said structures and having a portion located within the other structure in the region of its hinge edge wall and be-

tween the general planes of its side walls, said hinge leaf portion having an apertured part, an apertured part carried by and located within said last mentioned structure, a pintle extending through the apertured part of said hinge leaf and the apertured part of said last mentioned structure, whereby said hinge leaf is pivotally connected to the apertured part of said last mentioned structure and the door structure is hinged on said supporting structure, a torsion spring means having an arm effective on the aforesaid portion of said hinge leaf and normally urging said hinge leaf to swing in a door opening direction about the longitudinal axis of said pintle, said spring means being put in the desired loaded condition during the closing of the door structure and being effective to automatically open said door structure when it is closed and unlatched, and an elongated abutment member carried by the structure within which the apertured part of said hinge leaf is located for so limiting the movement of said spring arm in a door opening direction that said spring can effect the automatic movement of said door structure to a partially open position only, said hinge leaf portion being provided with an opening for the extension therethrough of said abutment member.

3. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to one of said structures and having a portion located within the other structure in the region of its hinge edge wall and between the general planes of its side walls, a part carried by and located within said last mentioned structure, a pintle pivotally connecting said hinge leaf portion to the aforesaid part of said last mentioned structure, whereby said door structure is hinged on said supporting structure, spring means effective on the aforesaid portion of said hinge leaf and normally urging said hinge leaf to swing in a door opening direction about the longitudinal axis of said pintle, said spring means being put in the desired loaded condition during the closing of the door structure and being effective to automatically open said door structure when it is closed and unlatched, and means cooperable with said spring means for preventing it from automatically moving said door structure beyond a predetermined partially open position.

4. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a pair of hinge leaves secured to said door structure and having apertured parts located within said supporting structure adjacent its hinge edge walls and between the general planes of its side walls, a one-piece member secured to and located within said supporting structure and having two spaced pairs of apertured eyes, the eyes of each such pair being separated to receive therebetween an apertured part of one of said hinge leaves, a pintle located entirely within said supporting structure and extending through the apertured parts of said hinge leaves and the apertured eyes of said member, whereby said hinge leaves are pivotally connected to said member and said door structure is hinged on said supporting structure, and a helical torsion spring surrounding said pintle between the two pairs of eyes and having an arm with a normal tendency to swing in a door opening direction, said spring arm being located between said member and one of said hinge leaves for cooperation with such hinge leaf, said spring through its arm being put in the desired loaded condition during the closing of the door structure and being effective by the cooperation of its arm with said last mentioned hinge leaf to automatically open said door structure when it is closed and unlatched.

5. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to said door structure and having a portion located within said supporting structure adjacent its hinge edge wall and between the general planes of its side walls, said hinge leaf portion having a pair of spaced apertured parts, a pair of apertured parts carried by and located within said supporting structure and spaced to receive therebetween the apertured parts of said hinge leaf, a pintle located entirely within said supporting structure and extending through the apertured parts of said hinge leaf and the apertured parts of said supporting structure, whereby said hinge leaf is pivotally connected to the apertured parts of said supporting structure and the door structure is hinged on said supporting structure, and a helical torsion spring surrounding said pintle between the spaced apertured parts of said hinge leaf and having an arm for cooperation with the aforesaid portion of said hinge leaf, said spring arm having a normal tendency to swing in a door opening direction and said hinge leaf portion being located between said spring arm and said door structure, said spring through its arm being put in the desired loaded condition during the closing of the door structure and being effective by the cooperation of its arm with said hinge leaf portion to automatically open said door structure when it is closed and unlatched.

6. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to said door structure and having a portion located within said supporting structure adjacent its hinge edge wall and between the general planes of its side walls, a part carried by and located within said supporting structure, a pintle located entirely within said supporting structure and pivotally connecting the aforesaid portion of said hinge leaf to the aforesaid part of said supporting structure, whereby said door structure is hinged on said supporting structure, and a helical torsion spring surrounding said pintle and having an arm for cooperation with the aforesaid portion of said hinge leaf, said spring arm having a normal tendency to swing in a door opening direction, said spring through its arm being put

in the desired loaded condition during the closing of the door structure and being effective by the cooperation of its arm with said hinge leaf portion to automatically open said door structure when it is closed and unlatched.

7. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to said door structure and extending into said supporting structure in the region of the hinge edge wall thereof, said hinge leaf being provided within said supporting structure and between the general planes of its side walls with a portion substantially parallel with the hinge edge wall of the door structure, a part carried by and located within said supporting structure, a pintle located entirely within said supporting structure and pivotally connecting the aforesaid portion of said hinge leaf and the aforesaid part of said supporting structure, whereby said door structure is hinged on said supporting structure, and a helical torsion spring surrounding said pintle and having an arm for cooperation with the aforesaid portion of said hinge leaf, said spring arm having a normal tendency to swing in a door opening direction and said hinge leaf portion being located between said spring arm and the door structure, said spring through its arm being put in the desired loaded condition during the closing of the door structure and being effective by the cooperation of its arm with said hinge leaf portion to automatically open said structure when it is closed and unlatched.

8. In combination with a door structure and a supporting structure therefor, wherein said supporting structure is provided with an internal transverse partition in spaced relation to its hinge edge wall, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to said door structure and having a portion extending into said supporting structure in the region of its hinge edge wall and between the general planes of its side walls, said hinge leaf portion having an apertured part located within said supporting structure, a member secured to the transverse partition of said supporting structure and having an apertured part extending toward the hinge edge wall of such supporting structure through an opening with which said partition is provided, a pintle located entirely within said supporting structure and extending through the apertured part of said hinge leaf and the apertured part of said member, whereby said hinge leaf is pivotally connected to said member and said door structure is hinged on said supporting structure, and a helical torsion spring surrounding said pintle and having an arm for cooperation with the aforesaid portion of said hinge leaf, said spring arm having a normal tendency to swing in a door opening direction, said spring through its arm being put in the desired loaded condition during the closing of the door structure and being effective by the cooperation of its arm with said hinge leaf portion to automatically open said door structure when it is closed and unlatched.

9. In combination with a door structure and a supporting structure therefor, concealed hinge means for so hinging said door structure on said supporting structure that the hinge edge walls of said structures are in oppositely positioned relationship when said door structure is in its closed position, said hinge means comprising a hinge leaf secured to said door structure and having a portion located within said supporting structure in the region of its hinge edge wall and between the general planes of its side walls, a part carried by and located within said supporting structure, a pintle located entirely within said supporting structure and pivotally connecting the aforesaid portion of said hinge leaf to the aforesaid part of said supporting structure, whereby said door structure is hinged on said supporting structure, and spring means cooperable with the aforesaid portion of said hinge leaf and normally urging said hinge leaf to swing in a door opening direction about the longitudinal axis of said pintle, said hinge leaf portion being located between said spring means and the door structure, said spring means being put in the desired loaded condition during the closing of the door structure and being effective by its cooperation with the aforesaid portion of said hinge leaf to automatically open said door structure when it is closed and unlatched.

RUDOLPH I. SCHONITZER.