My invention relates to door hinges combined with checks for automatically swinging the doors to their closing positions and at the same time retarding and cushioning the closing movement so as to effect a noiseless closing of the doors.

A primary object of the invention is to provide a combination door-hinge and check, in which pneumatic means and spring means are associated in a unitary device in such a manner as to effect a noiseless closing of a door with a minimum movement of such a door and a consequent minimum strain on the device in order to maximize its durability.

Another important object of the invention is to provide a device of this kind in which the tension of the spring means is adjustable so as to effect the closing of a door with more or less force, according to requirements.

A further object is to construct a device of this kind with few working parts, so that the device may be manufactured at a low cost.

Still further objects and advantages will appear from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate a preferred embodiment of the invention and in which:

Figure 1 is a front view of a portion of a door and a portion of a door-frame member with a combination door-hinge and check of my invention applied thereto, the cylinder being shown partly in section and broken away in order to more clearly disclose the piston's connection with its actuating member:

Figure 2 is a sectional view taken along the line 2—2 in Figure 1, a part of the piston being broken away in order to show the connection of the piston rod with the piston, the door and parts of the operative mechanism of the device, with the door in an open position, being shown in dotted lines:

Figure 3 is a transverse, sectional view taken along the line 3—3 in Figure 1; and

Figure 4 is a perspective view of a portion of a door frame member, with such a hinge attached thereto as is adapted to be used in conjunction with the combination door-hinge and check of my invention.

The combination door-hinge and check of my invention is indicated in the drawings as a whole by the number 1 and comprises a base plate 2 and a base plate 3 suitably drilled and countersunk so as to adapt the plates to be respectively secured to a door 4 and a door frame member 5 by screws 6. Although the device 1 may be applied to any door and associated door-frame member, it is primarily intended to be used in connection with screen doors. For this purpose the plate 2 has side portions 7 bent up at right angles to the plate, and the plate 3 is provided with side portions 8, which are bent up at right angles thereto and fit over the portions 7. These bent-up portions 7 and 8 are perforated at a distance from the respective plate and have rivets 9 extending through the perforations of the respective portions for pivotally securing the plates to each other, the arrangement of the portions 7 and 8 and the pivotal connections thereof being such that the plates are rotatable relative to each other on an axis virtually parallel with the plates, so that the plates may be swung to or beyond a common plane.

Figures 2 and 3 show in full lines particularly how the plates, attached respectively to the door 4 and the door-frame member 5, are in a common plane when the door 4 is in its closed position, but it is understood that the arrangement is such that it will allow the plates to swing beyond that position, if the door is so fitted as to permit such additional pivotal movement of the plates.

Near the end remote from the pivotal axis of the plate 2 the plate has thereon at each side formed a perforated lug 10 arranged somewhat out of alignment with the respective bent-up portion 7, and each of the lugs has secured thereto one end of a tension coil spring 11, the arrangement being such that the springs are thus spaced apart and each spring extends along the respective portion 7 and along the plate 2 between the plate and a plane parallel therewith and taken through the axis of the pivots 9. The other plate 3 has integrally formed thereon two tubes 12, each of which is provided with a passage 13 adapted to be aligned with the respective spring when the plates are held in the aforementioned common plane. A rod 14, extending thru each passage and beyond the ends of the respective tube, is toward the respective spring 11 at its end provided with an eye 15, which is offset from the rod and connected with the end of the spring not attached to the plate 2, while the other end of
the rod is threaded and has adjustably secured thereon a nut 16 for regulating the spring tension, so that the springs are thereby adapted to force the plates to or beyond the common plane and thus hold the door in its closed position, as shown in full lines in Figure 2.

Integral with the plate 2 and extending between the springs 11 is a cylinder 17, which opens with one end toward the plate 3 and has its other end closed and provided with an adjustable air valve 18 for regulating the flow of air from the cylinder.

A member 19 is integrally formed on the plate 3 and is provided with a bifurcated portion 20, which is substantially aligned with the axis of the cylinder when the plates are swung to the common plane, and in the cylinder is a piston 21, which has one end of a piston rod 22 pivotally connected therewith, as shown at 23, the other end of the piston rod being pivotally connected, as shown at 24, with, and at the end of, the bifurcated portion 20 between the branches thereof in such a way that the piston rod is held in axial alignment with the cylinder, when the plates are in the common plane, as when the door is swung to its closed position.

Preferably, the bifurcated portion extends past the axis of the pivots 9 so that the pivot 24 is in such an eccentric relation to the axis of the pivots 9 and is so movable relative to the plate 2 as to cause a minimum but sufficient reciprocating movement of the piston in the cylinder, when the door is swung from its closed to its open position, as shown in dotted lines in Figure 2, when the door is automatically returned to its closed position by the springs 11, there will therefore be a sufficient quantity of air compressed within the cylinder for cushioning the effect of the closing movement. The cushioning effect may be regulated to a nicety by means of the valve 18.

It should be observed that by means of offsetting the eye 15 from the rod 14, the rod is allowed a maximum swinging movement in its passage 13. Therefore, when the door is swung to an open position, the rod will partly follow this movement until the rod is stopped by the wall of the passage, so that the movement of the rod will correspondingly lessen the distance of the tensile movement of the respective spring 11.

Although in the preferred embodiment of the device I employ two springs 11, it is understood that one spring of sufficient strength will accomplish the same purpose. I therefore do not limit myself to the arrangement shown and described, but I may vary it in order to make my device suitable for use in conjunction with doors of different types and sizes. I also reserve the right to make such other modifications in the construction of the device as are in accordance with the spirit of my invention and fall within the scope of the appended claims.

It is clear from the foregoing that a door hinge and check, included in a unitary device according to my invention, has distinct advantages over such devices in which the door hinges are separate from the door checks, because of the saving in manufacturing cost and because of the facilitation of application of my device, and the compactness of the device and the arrangement of its parts also make it superior to other, heretofore known devices in which door hinges are combined with checking devices into unitary structures.

The pivots 9 are, as before observed, at a distance from the respective plates 2 and 3. For the purpose of obtaining a perfect alignment of the door pivots I employ, as shown in Fig. 4, in connection with the combination door hinge and check 1 one or more hinges 25 for each door according to the individual requirements. Each hinge 25 consists of two base plates 26 and 27, which, like the base plates 2 and 3, are drilled and countersunk and thus adapted to receive screws 28 therein for respectively securing the plates to the door-frame member 5 and the door 4. The plates 26 and 27 are respectively provided with bent-up side portions 29 and 30, the bent-up side portion 29 of the plate 26 corresponding with the bent-up side portions 7 of the plate 2, and the bent-up side portions 30 of the plate 27 corresponding with the bent-up side portions 8 of the plate 3, and the side portions 29 and 30 are similarly perforated as the side portions 7 and 8 and have rivets 31 extending through the perforations for pivotally securing the plates 26 and 27 to each other and thus forming the completed hinge 25.

I claim as my invention:

1. A combination hinge and check comprised two base plates secured to each other on a pivotal axis virtually parallel with the plates so as to allow the plates to be swung to or beyond a common plane; a tension coil spring extending along one plate between said plate and a plane parallel therewith and taken through said axis, said spring having one end attached to said plate and its other end attached to the second plate so as to force the plates to or beyond said common plane; a cylinder integral with the first plate, said cylinder opening with one end to the second plate and having its other end closed but provided with an air opening; a member integral with the second plate; a piston in the cylinder; and a piston rod pivotally secured at one end to said piston and at its other end to said member, the pivot of the member being eccentric relative to said pivotal axis, as, and for the purpose, set forth.

2. A combination door hinge and check
comprising a pair of members securable to a door frame and a door, said members being hingedly secured to each other, a cylinder carried by one member, and a piston mounted in said cylinder and being connected to the other member, the connection between said piston and said member being eccentric to the pivotal line of said members, tension springs carried by one of said members and disposed exterior of said cylinder, means pivotally connected to said springs and mounted to the other member so as to have a slight swing, said pivotal connection being disposed between the pivotal connection of said members and the door during the entire movement of said door.

3. A door hinge comprising a pair of members securable to a door frame and a door, said members being hingedly secured to each other, tension springs carried by one of said members, means pivotally connected to said springs and mounted on the other member so as to have a slight swing, said pivotal connection between said springs and means being disposed between the pivotal connection of said members and the door during the entire movement of said door.

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