

[54] HINGE CAPABLE OF TRANSMITTING
PRESSURIZED AIR

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[57] ABSTRACT

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[58] Field of Search..... 16/128 R, 137, 161;
74/257; 308/120

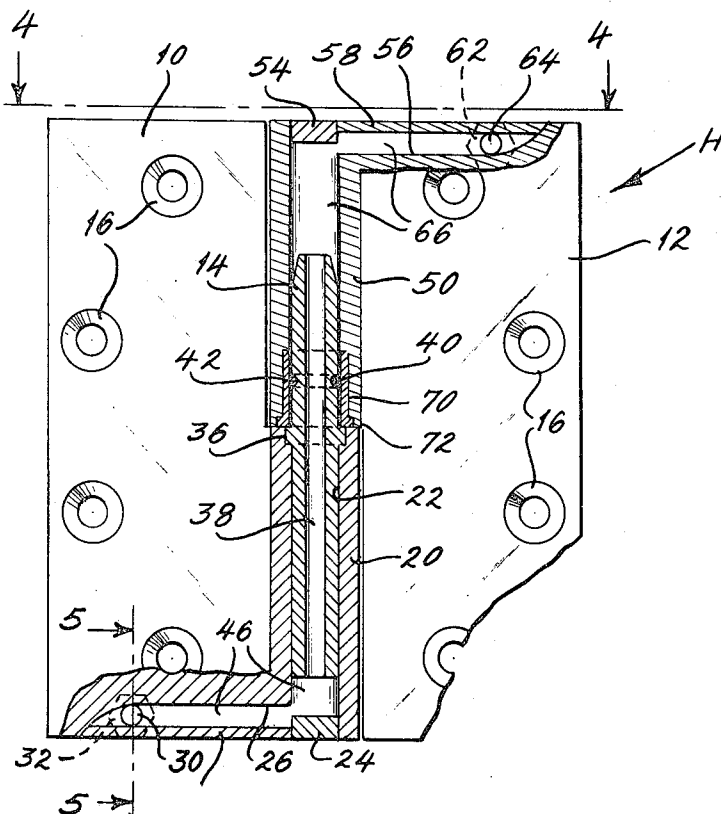
A hinge has a pair of leaves provided with aligned
knuckles and connected together at the knuckles with
a hollow hinge pin. Each leaf has a fluid channel ex-
tending through it and the fluid channels of the two
leaves communicate through the hollow hinge pin
which is secured in one of the knuckles and sealed
against the other by an O-ring.

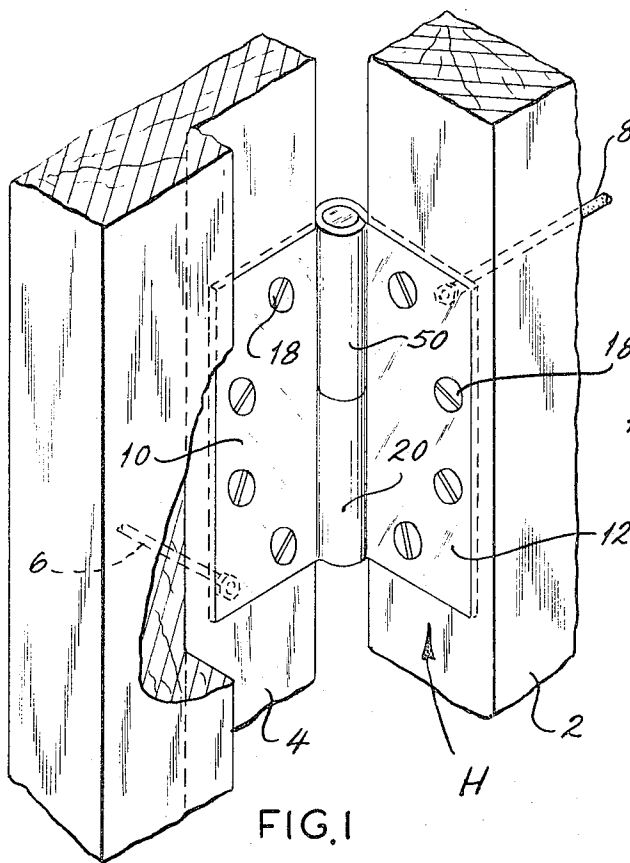
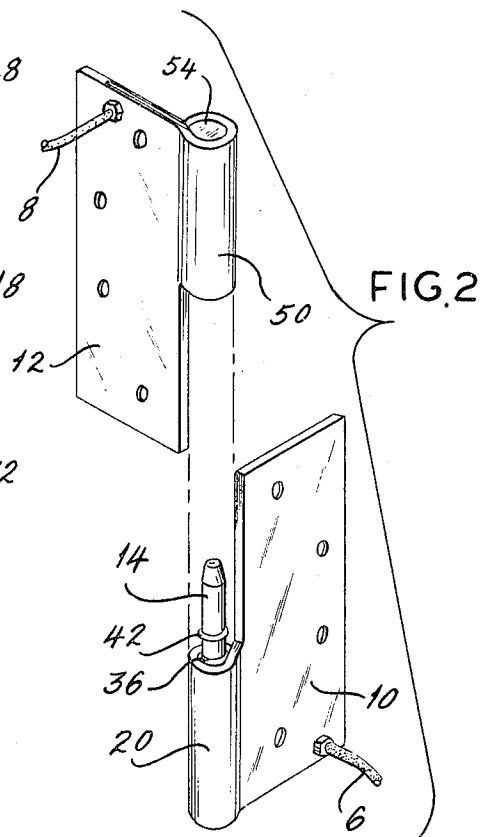
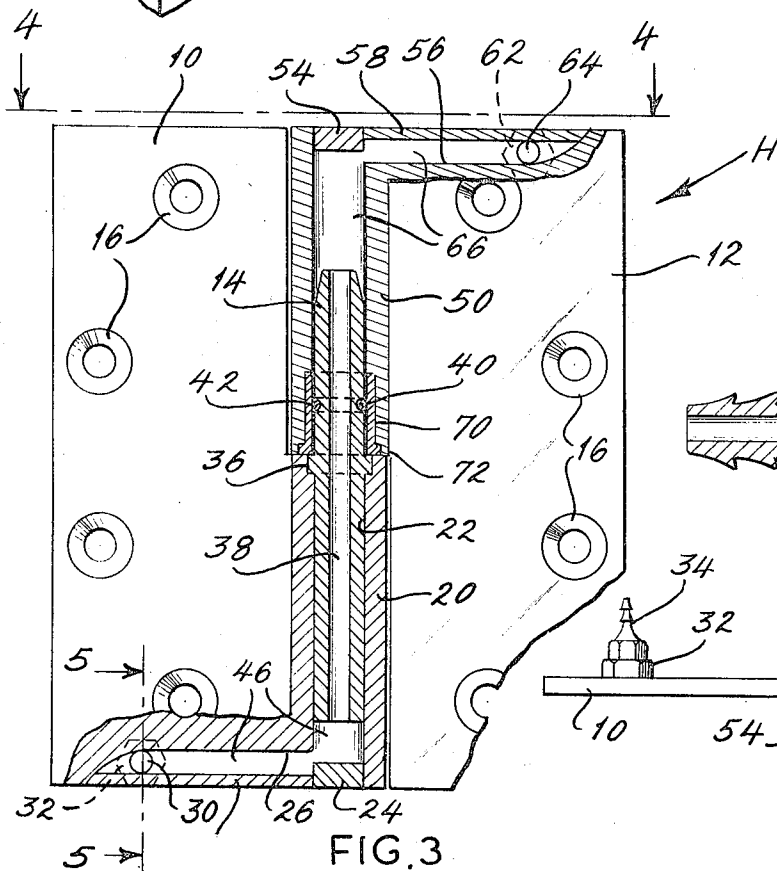
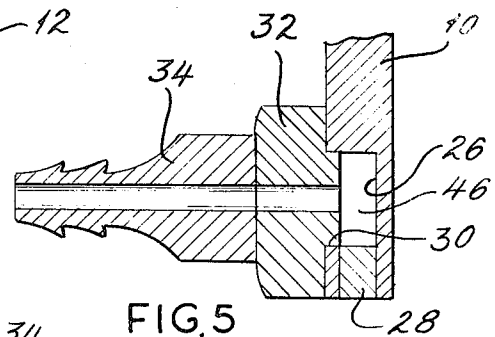
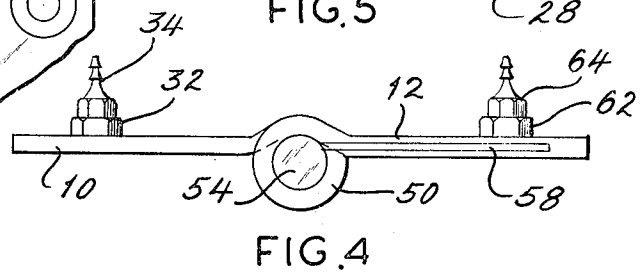
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9 Claims, 5 Drawing Figures





HINGE CAPABLE OF TRANSMITTING PRESSURIZED AIR

BACKGROUND OF THE INVENTION

This invention relates in general to hinges and more particularly to a hinge capable of transmitting pressurized air.

Some doors are provided with air-operated appliances and to actuate these appliances pressurized air must be introduced into the door from the surrounding frame. For example, a door may be provided with an air-operated door opener which is supplied with air when a panic bar or handle on the door is depressed to assist an individual opening the door. Likewise, the door may be provided with an air-operated lock or an air cylinder to hold the door open in an emergency. The normal procedure for introducing air into the door to operate these appliances is to install a looped hose between the hinge jamb and the adjoining side of the door. This hose, of course, flexes as the door is opened and closed. The constant flexing eventually causes the hose to crack. Moreover, the flexible hose is exposed where it can be tampered with or inadvertently torn loose.

SUMMARY OF THE INVENTION

One of the principal objects of the present invention is to provide a hinge capable of transmitting pressurized air from a door jamb to a door in order to actuate air-operated appliances carried by the door. Another object is to provide a hinge of the type stated which transmits pressurized air without exposing the air line. A further object is to provide a hinge of the type stated which is simple in construction and economical to manufacture. These and other objects and advantages will become apparent hereinafter.

The present invention is embodied in a hinge having hinge leaves provided with aligned knuckles and air channels. The air channels communicate with each other through the knuckles. The invention also consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the specification and wherein like numerals and letters refer to like parts wherever they occur:

FIG. 1 is a perspective view of the hinge of the present invention installed between a door frame and door;

FIG. 2 is an exploded perspective view showing the back faces of the hinge leaves;

FIG. 3 is an elevational view of the hinge showing the knuckles and hinge pins in section;

FIG. 4 is a top plan view of the hinge taken along lines 4—4 of FIG. 3; and

FIG. 5 is a sectional view of one of the hinge leaves taken along lines 5—5 of FIG. 3.

DETAILED DESCRIPTION

Referring now to the drawings (FIG. 1), H designates a full mortise hinge of the loose joint variety for supporting a door 2 on the hinge jamb 4 of a door frame. The hinge H is used in conjunction with at least one other hinge and preferably two other hinges. These other hinges (not shown) are also full mortise hinges set into the door 2 and hinge jamb 4 and may likewise be of the loose joint variety or they may be of the more

typical hinge construction with three or more interlocking knuckles. The hinge H differs from the other hinges in that it possesses the capability of transmitting a pressurized fluid from the hinge jamb 4 to the door 2 without loss in pressure. In particular, the air enters the hinge H through an air hose 6 concealed in the hinge jamb 4 and leaves through an air hose 8 concealed in the door 2. The air hose 6 is connected with a source of pressurized air, whereas the air hose 8 is connected to some air-operated appliance on the door 2.

The hinge H includes (FIGS. 1 and 2) a frame leaf 10 and a door leaf 12, both of which are preferably formed from steel or some other suitable metal and are held together by a hinge pin 14 secured in the frame leaf 10. Each leaf 10 and 12 has a plurality of countersunk holes 16 for accommodating flat head screws 18 used to secure the leaves 10 and 12 to the frame 4 and door 2, respectively.

The frame leaf 10 is mortised into the hinge jamb 4 with its back face abutting the jamb 4 and one of its side edges generally aligned with the edge of that jamb. Along the lower half of that side edge the leaf 10 is rolled into an integrally formed knuckle 20 having a bore 22 which is counterbored at its upper end. The joint within the rolled knuckle 20 is soldered or brazed shut so that the bore 22 is air-tight along its sides. The hinge pin 14 is pressed into the bore 22 and projects upwardly from the upper end of the knuckle 20 (FIG. 3), but does not extend all the way through the knuckle 20. Fitted into the lower end of the bore 22 is a plug 24 which closes the lower end of the knuckle 20.

Milled into the lower edge of the frame leaf 10 is a downwardly opening groove 26 (FIGS. 3 and 5) which extends from the bore 22 of the knuckle 20 almost to the other side edge of the leaf 10. The groove 26 receives a metal closure strip 28 which fits snugly therein flush with the bottom edge of the leaf 10. One end of the closure strip 28 abuts the plug 24, while the other end is at the opposite end of the groove 26. Both the plug 24 and closure strip 28 are secured firmly in position by soldering or brazing which is continuous and along every joint so that pressurized air will not escape from the bore 22 or groove 26. The mortising of the leaf 10 conceals the closure strip 28 and prevents it from being detected when the leaf 10 is secured to the hinge jamb 4.

The closure strip 28 is not as deep as the groove 26 and as a result a small cavity exists within the leaf 10 immediately above the closure strip 28 (FIGS. 3 and 5). This cavity opens into the bore 22 of the knuckle 20 below the hinge pin 14 and above the plug 24. The cavity at its opposite end opens toward the hinge jamb 4 through an aperture 30 which registers with a nut 32 brazed to the back face of the leaf 10. Threaded into the nut 32 is an air fitting 34 which has a serrated shank projected into the end of the hose 6 in the jamb 4. In this connection, the hinge jamb 4 must be provided with a small hole leading from the mortise to accommodate the nut 32 and fitting 34.

The hinge pin 14 is formed from steel or some other suitable metal and intermediate its ends it is provided with a flange 36 which fits into the upper counterbore in the bore 22 and locates the pin 14 axially within the knuckle 20 (FIG. 3). The circular joint around the flange 36 is sealed with solder or braze so that no air can pass through it. The hinge pin 14 has a bore 38 ex-

tending completely through it, and at its upper end is tapered. Intermediate the taper and the flange 48, the hinge pin is provided with an outwardly opening circumferential groove 40 which receives an O-ring 42 formed from an elastomeric material. The O-ring 42 projects beyond the cylindrical outer surface of the pin 14.

The bore 38 of the pin 14, the bore 22 of the knuckle, the unoccupied portion of the groove 26, and the aperture 30 together form an air channel 46 through the hinge leaf 10, and this channel begins at the fitting 34 and terminates at the tapered upper end of the pin 14.

The door leaf 12 is practically identical to the frame leaf 10, only it is turned upside down with respect to the frame leaf 10. The door leaf 12 includes a knuckle 50 having a bore 52 extending through it, and this bore is counterbored twice at its lower end and is further sized to receive the portion of the hinge pin 14 projecting upwardly from the knuckle 20 on the frame leaf 10. A clearance fit exists between the pin 14 and the bore 52 so that the leaf 12 will pivot easily with respect to the leaf 10. The joint along the side of the rolled knuckle 50 is soldered or brazed shut to make the bore 52 air-tight at its sides. The upper end of the bore 52 is fitted with a plug 54. Milled into the upper edge of the leaf 12 is an upwardly opening groove 56 and this groove 56 opens into the bore 52 of the knuckle 50 below the plug 54. The groove 56 receives a closure strip 58 which is not as deep as the groove 56, so that a cavity exists within the groove 56 below the strip 58. The plug 54 and strip 58 are secured in the leaf 12 by soldering or brazing which is continuous along all joints so that pressurized air will not escape past the plug 54 and strip 58. The mortising conceals the closure strip 58 so that its presence is not detected. The groove 56 opens rearwardly through an aperture 60 in the door leaf 12, and this aperture registers with a nut 62 brazed to the back face of the door leaf 12. Threaded into the nut 62 is an air fitting 64 to which the air hose 8 is attached. In this regard, the door is provided with a small hole extending inwardly from its mortise to accommodate the air fitting 64.

The bore 52, the unoccupied portion of the groove 56, and the aperture 60 form an air channel 66 through the door leaf 12, and the terminal end of that air channel 66 is at the air fitting 64.

Press fitted into the double counterbore at the lower end of the bore 52 in the knuckle 50 is a bushing 70 (FIG. 3) made from a low friction material such as DELRIN plastic. The major part of the bushing 70 is in the smaller counterbore, but at its lower end the bushing 70 has a locating flange 72 which fits into the larger of the two counterbores. The bushing 70 has a bore 74 which is the same size as the bore 52 of the knuckle so that the walls defining the two bores 52 and 74 are flush. The length of the bushing 70 is about twice the distance from the O-ring 42 to the flange 36 on the pin 14 so that when the pin 14 is fully inserted into the knuckle 50, the O-ring 42 will be located approximately midway between the ends of the bushing 70.

INSTALLATION AND OPERATION

To install the hinge H between the door 2 and the hinge jamb 4 of the door frame, the leaves 10 and 12 in a separated condition are first mounted on the jamb 4 and door 2, respectively. In this connection, the hinge jamb 4 prior to installation of the frame leaf 10 is mor-

tised and provided with a hole to accommodate the air fitting 34, the hole opening outwardly from the mortise. The air hose 6 is installed in the jamb 4 with the end of that hose projecting from the hole in the mortise. Then the hose 6 is attached to the air fitting 34 and the leaf 10 is fitted into the mortise and secured with the screws 18 extended through the countersunk holes 16. The door 2 is likewise provided with a mortise and a hole opening out of that mortise to accommodate the air fitting 64. The hose 8 projects out of this hole and is attached to the air fitting 64 on the door leaf 12. Then the leaf 12 is fitted into the mortise and secured with the screws 18 extended through the countersunk holes 16 in it.

Once the frame leaf 10 and door leaf 12 are secured to the frame 4 and door 2, respectively, the door 2 is lifted upwardly to a position in which the knuckle 50 of the door leaf 12 is above the hinge pin 14, yet is axially aligned with it. Then the door 2 is lowered, allowing the knuckle 50 to pass over the tapered upper end of the hinge pin 14. In time, the bushing 70 passes over the O-ring 42 and compresses or deforms the ring 42 inwardly as it does. When the door 2 is in its final position the lower end of the knuckle 50 on the door leaf 12 is against the upper end of the knuckle 20 on the frame leaf 10 so that the frame leaf 10 can provide subjacent support for the door 2. Moreover, the O-ring 42 forms a seal between pin 14 and bushing 70, yet permits the leaf 12 to pivot relative to the leaf 10 about the hinge pin 14.

When pressurized air is supplied to the hose 6, the air passes through the air channel 46 in the frame leaf 10 and thence into the channel 6 in door leaf 12, irrespective of the angular position of that leaf. The air leaves the door leaf 12 at the air fitting 64 therein and flows into the hose 8 which is connected to the air-operated appliance. The air channels 46 and 66 are completely sealed within the hinge H so that no air or pressure is lost at the hinge H.

This invention is intended to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. A hinge comprising first and second leaves having aligned knuckles, a hinge pin sealed in the knuckle of the first leaf and projected therefrom into the knuckle of the second leaf for holding the leaves together while allowing them to pivot relative to each other, the leaves having fluid channels therein which are in communication so that a pressurized fluid can be transmitted from one leaf to the other.

2. A hinge according to claim 1 wherein the fluid channel of the first leaf extends through the hinge pin.

3. A hinge according to claim 2 wherein the fluid channel of each hinge leaf extends through the knuckle of that leaf and thence along an end of the leaf.

4. A hinge according to claim 2 wherein each leaf has a groove opening out of one of its end edges with the groove opening at one of its ends into the knuckle for that leaf, and a closure strip fitted into the groove and occupying only a portion thereof, the unoccupied portion of the groove forming part of the air channel for the leaf.

5. A hinge according to claim 2 wherein the leaves have front faces which face each other when the hinge

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is closed and back faces which are on the opposite sides thereof and normally about a positioning surface when the hinge is mounted, and wherein the air channels open out of the back faces of the hinge.

6. A hinge according to claim 2 wherein the pin has an outwardly opening groove and an annular sealing element in the groove, the sealing element engaging a sealing surface in the knuckle of the second leaf and the air channel for the first leaf opening out of the hinge pin beyond the sealing element.

7. A hinge according to claim 6 wherein a bushing is fitted into the knuckle of the second leaf and the sealing surface against which the sealing element bears is in the bushing.

8. A hinge comprising a first leaf having front and back faces and a knuckle, the first leaf also having a fluid channel which is in part located within the knuckle, a second leaf having front and back faces and a knuckle which aligns with the knuckle of the first leaf,

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the second leaf having a fluid channel therein which is in part located within the knuckle of the second leaf, the fluid channels of the first and second leaves being in communication at the knuckles so that a pressurized fluid can be transmitted from one leaf to the other, and means joining the leaves to enable one leaf to pivot relative to the other leaf from a closed position wherein the leaves are together with their front faces facing each other to open positions wherein the leaves are spread apart.

9. A hinge according to claim 8 wherein the means for joining the leaves is a hinge pin which extends from the knuckle of the first leaf into the knuckle of the second leaf, and wherein the fluid channel for the first leaf extends through the hinge pin and communicates with the fluid channel for the second leaf at the end of the hinge pin.

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