

SYMMETRIC DOOR

FIELD OF THE INVENTION

The present invention relates to doors generally and more particularly to door handle devices.

BACKGROUND OF THE INVENTION

Hinged doors are well known in the art. Conventionally, hinges are located on one side of a door and the door fits into a suitable frame. Generally doors are pre-assembled either for left side hinges or right side hinges.

If a door is constructed to be mounted with the hinges on the right side, inverting the door for mounting in a frame with hinges on the left side generally requires substantial modification of the frame, the door or both. Moreover, a requirement of human engineering dictates that the natural direction for turning the handle to open a door is downwards. In the prior art, by inverting the door the direction of the handle movement is also inverted. Thus, the handle of the inverted door would have to be turned upwards for opening, which is undesirable in terms of human engineering.

SUMMARY OF THE INVENTION

The present invention seeks to provide an improved door which is substantially symmetric, that is, can readily be mounted in a frame regardless of the mounting side of the hinges. Moreover, the present invention comprises an internal mechanism for opening the door, or for actuating a bolt mechanism, wherein the handle is always turned downwards for opening, regardless of the mounting orientation of the door.

There is thus provided in accordance with a preferred embodiment of the present invention a door handle device including a pair of meshed gears each adapted to be turnable by a handle, the gears being operably attached to a door bolt mechanism, wherein turning of one of the gears in a first direction causes turning of the other gear in a second direction opposite to the first direction, the turning of at least one of the gears causing operation of the door bolt mechanism.

It is noted that throughout the claims and the specification, the term door bolt includes any lever, latch, bolt or linkage useful to open, close or lock a door.

There is also provided in accordance with a preferred embodiment of the present invention, a door including a door handle device including a pair of meshed gears each adapted to be turnable by a handle, the gears being operably attached to a door bolt mechanism, wherein turning of one of the gears in a first direction causes turning of the other gear in a second direction opposite to the first direction, the turning of at least one of the gears causing operation of the door bolt

mechanism.

In accordance with a preferred embodiment of the present invention, the door includes a symmetric molding.

Additionally in accordance with a preferred embodiment of the present invention, the door includes a locking mechanism attachable to one of the gears.

Further in accordance with a preferred embodiment of the present invention, the door is a blast proof door.

There is also provided in accordance with a preferred embodiment of the present invention, a method for reversing the hinged orientation of a door including:

- providing a handle;

- providing a door including a door handle device including a pair of meshed gears each adapted to be turnable by a handle and one of the gears being attached to a handle, the gears being operably attached to a door bolt mechanism, wherein turning of one of the gears in a first direction causes turning of the other gear in a second direction opposite to the first direction, the turning of at least one of the gears causing operation of the door bolt mechanism;

- removing the handle from attachment with one of the gears; and

- directly attaching the handle to the other gear.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawing in which:

Fig. 1 is a simplified pictorial illustration of a door constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is a partial sectional view of the door of Fig. 1, taken along lines II - II in Fig. 1;

Fig. 3A is a simplified illustration of a door handle device in the door of Fig. 1, constructed and operative in accordance with a preferred embodiment of the present invention, in the same orientation of the door illustrated in Fig. 1, with a handle attached to one of a pair of gears;

Fig. 3B is a simplified illustration of the door handle device of Fig. 3A with the handle turned downwards;

Fig. 3C is a simplified illustration of the door handle device of Fig. 3A with the handle prior to being turned upwards;

Fig. 3D is a simplified illustration of the door handle device of Fig. 3C with the handle turned upwards;

Fig. 4 is a simplified illustration of the door handle device of Fig. 3A inverted 180 degrees with respect to the orientation of Fig. 3A;

Fig. 5 is a simplified illustration of the door handle device as oriented in Fig. 4, with the handle attached to the other of the pair of gears; and

Fig. 6 is a simplified side view illustration of a locking mechanism attached to the door handle device of Fig. 3A.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Figs. 1 - 2, which illustrate a door 10 constructed and operative in accordance with a preferred embodiment of the present invention. As seen in Fig. 1, door 10 preferably includes a molding 12 attached symmetrically about the periphery of door 10, a handle 14 and hinges 15. Handle 14 is attached to a door handle device 16, shown in Fig. 2.

Door handle device 16 includes a pair of meshed gears 18 and 20 each adapted to be directly turnable by handle 14. Gears 18 and 20 are operably attached to a door bolt mechanism, generally indicated by reference numeral 22. Door bolt mechanism 22 may comprise, for example, a tongue 24, linkage arms 26a and 26b and conventional bolt assemblies 28. The operable attachment of gears 18 and 20 to door bolt mechanism 22 is described further hereinbelow with respect to Figs. 3A - 3D.

Door 10 is illustrated in Fig. 2 with reinforcing members 30, such as those included in the reinforced door commercially available from MUL-T-LOCK LTD. of Yavne, Israel, and marketed under the tradename Pladelet. In accordance with another preferred embodiment of the present invention, door 10 is a blast proof door. It is appreciated that door 10 may be any type of door comprising a door bolt mechanism.

Referring now to Fig. 3A, it is seen that handle 14 is directly attached to gear 20 of door handle device 16, preferably by fitting into a non-circular, typically rectangular, hole 31. Tongue 24 is preferably linked to gears 18 and 20 by means of two bosses 32 each of which is adapted to slide in an arcuate channel

34 formed in each of gears 18 and 20. Linkage arm 26a is preferably linked to gear 18 by means of a boss 36 which is adapted to slide in an arcuate channel 38 formed in gear 18. Linkage arm 26b is preferably linked to gear 20 by means of a boss 40 which is adapted to slide in an arcuate channel 42 formed in gear 20.

By turning handle 14 in the direction of an arrow 44, gear 20 is caused to turn in the direction of an arrow 46 in the same sense as arrow 44, and gear 18 is caused to turn in the direction of an arrow 48 opposite to the direction of arrow 46. The turning of gear 20 in the direction of arrow 46 and gear 18 in the direction of arrow 48 causes tongue 24 to move generally in the direction of an arrow 50 to the orientation shown in Fig. 3B, allowing door 10 to be opened. Tongue 24 preferably biases against a spring 52.

Referring to Fig. 3B, it is seen that turning handle 14 in the direction of arrow 44 does not cause movement of linkage arms 26a and 26b because bosses 36 and 40 slide freely in channels 38 and 42 respectively.

Reference is now made to Fig. 3C which illustrates movement of linkage arms 26a and 26b. By turning handle 14 in the direction of an arrow 45, gear 20 is caused to turn in the direction of an arrow 47 in the same sense as arrow 45, and gear 18 is caused to turn in the direction of an arrow 49 opposite to the direction of arrow 47. The turning of gear 18 in the direction of arrow 49 causes linkage arm 26a to move generally in the direction of an arrow 53, and the turning of gear 20 in the

direction of arrow 47 causes linkage arm 26b to move generally in the direction of an arrow 55 to the orientation shown in Fig. 3D. In the orientation shown in Fig. 3D, door 10 is generally closed or locked.

Referring to Fig. 3D, it is seen that turning handle 14 in the direction of arrow 45 does not cause movement of tongue 24 because bosses 32 slide freely in channels 34.

Reference is now made to Fig. 4 which illustrates door handle device 16 inverted 180 degrees from the orientation illustrated in Fig. 3A. It is seen that handle 14 must be turned in the direction of arrow 44 in order to move tongue 24 in the direction of arrow 50. However, this entails moving handle 14 upwards in the sense of Fig. 4 instead of downwards as in the sense of Fig. 3A. Moving a handle upwards to open door bolt mechanisms is undesirable with regard to human engineering.

Conversely, it is seen that handle 14 must be turned in the direction of arrow 45 in order to move linkage arms 26a and 26b in the direction of arrows 55 and 53 respectively. However, this entails moving handle 14 downwards in the sense of Fig. 4 instead of upwards as in the sense of Fig. 3C. Moving a handle downwards to close or lock door bolt mechanisms is undesirable with regard to human engineering.

Reference is now made to Fig. 5 which shows handle 14 removed from gear 20 and directly attached to gear 18. It is appreciated that turning handle 14 in the direction of an arrow 56, which is downwards in the sense of Fig. 5, causes gear 18 to turn in the direction of arrow 48 and gear 20 to turn in the direction of arrow 46, thereby causing tongue 24 to move in the

direction of arrow 50, thereby opening door 10. Turning handle 14 in the direction of arrow 56 does not cause movement of linkage arms 26a and 26b, as described above.

Conversely, it is appreciated that turning handle 14 in the direction of an arrow 57, which is upwards in the sense of Fig. 5, causes gear 18 to turn in the direction of arrow 58, thereby causing linkage arm 26a to move in the direction of arrow 55, and gear 20 to turn in the direction of arrow 59, thereby causing linkage arm 26b to move in the direction of arrow 53, thereby closing or locking door 10. Turning handle 14 in the direction of arrow 57 does not cause movement of tongue 24, as described above.

Thus door handle device 16 allows door 10 to be mounted either in the orientation shown in Fig. 1 or inverted 180 degrees from the orientation of Fig. 4, wherein opening actuation of the door bolt mechanisms always involves turning handle 14 downwards, and closing or locking actuation of the door bolt mechanisms always involves turning handle 14 upwards.

Reference is now made to Fig. 6 which shows that door handle device 16 may be fitted with a locking mechanism 60. In the illustrated embodiment, handle 14 is attached to gear 18 and locking mechanism 60 is attached to gear 20. It is appreciated that handle 14 may be attached to gear 20, as in Fig. 4, and then locking mechanism 60 is attached to gear 18.

Locking mechanism 60 is preferably a push type of lock with a locking cylinder, as is well known in the art. In the embodiment illustrated in Fig. 6, locking mechanism 60 is

operative to substantially prevent rotation of gear 20. Thus locking mechanism 60 may be used to lock one or more of the door bolt mechanisms of door 10.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove but includes reasonable variations and modifications thereto. The scope of the present invention is defined only by the claims which follow:

C L A I M S

1. A door handle device comprising:
a pair of meshed gears each adapted to be turnable by a handle, said gears being operably attached to a door bolt mechanism,
wherein turning of one of said gears in a first direction causes turning of said other gear in a second direction opposite to said first direction, said turning of at least one of said gears causing operation of said door bolt mechanism.
2. A door comprising:
a door handle device comprising a pair of meshed gears each adapted to be turnable by a handle, said gears being operably attached to a door bolt mechanism,
wherein turning of one of said gears in a first direction causes turning of said other gear in a second direction opposite to said first direction, said turning of at least one of said gears causing operation of said door bolt mechanism.
3. A door according to claim 2 and further comprising a symmetric molding.
4. A door according to either of claims 2 and 3 and comprising a locking mechanism attachable to one of said gears.
5. A door according to any of claims 2 - 4 and wherein said door is substantially blast proof.



6. A method for reversing a hinged orientation of a door including:

providing a handle;

providing a door including a door handle device including a pair of meshed gears each adapted to be turnable by a handle and one of said gears being attached to a handle, said gears being operably attached to a door bolt mechanism, wherein turning of one of said gears in a first direction causes turning of said other gear in a second direction opposite to said first direction, said turning of at least one of said gears causing operation of said door bolt mechanism;

removing said handle from attachment with one of said gears; and

directly attaching said handle to said other gear.

