Jan. 21, 1969 L. R. DICKINSON ET AL 3,422,487

GEARED HINGE WITH FLOATING RACK BAR

Filed Dec. 9, 1966 Sheet 1 of 4

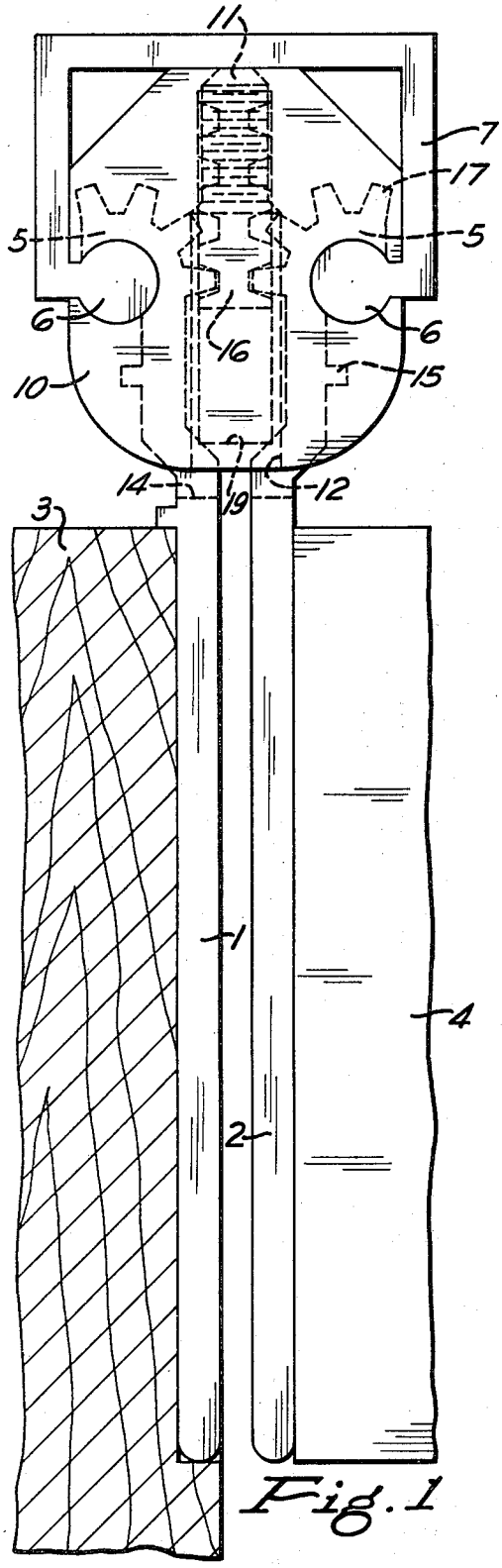


Fig. 1

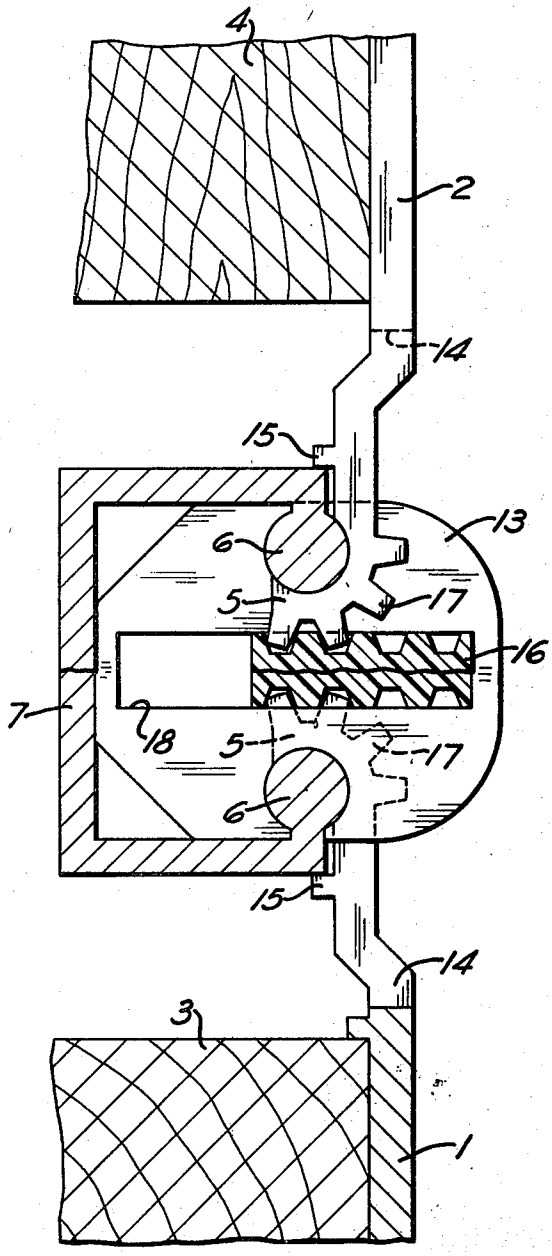


Fig. 3

INVENTORS.
LLOYD R. DICKINSON
MARIO J. BRANCATI
BY
Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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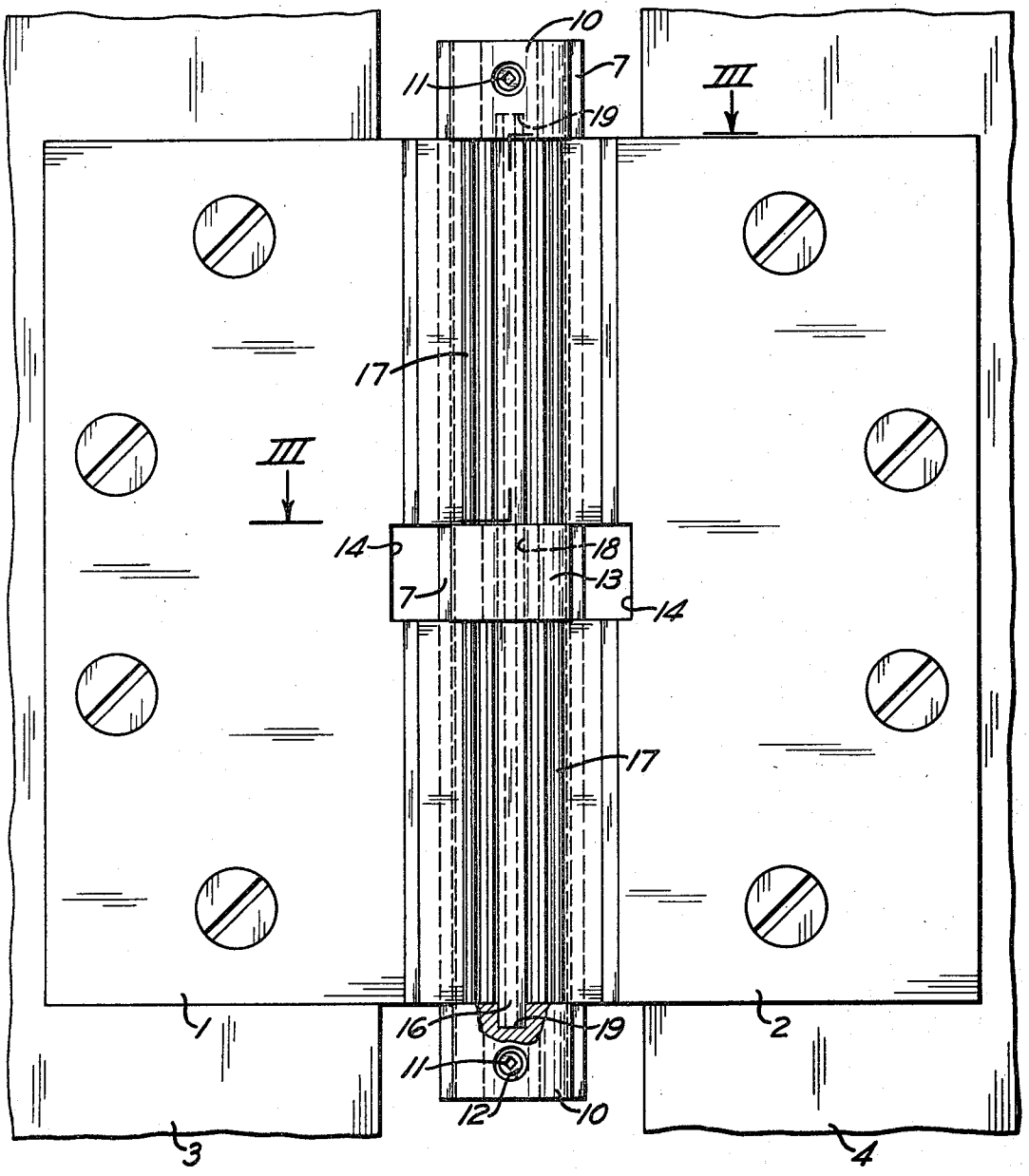


Fig. 2

INVENTORS.
LLOYD R. DICKINSON
MARIO J. BRANCATI
BY
Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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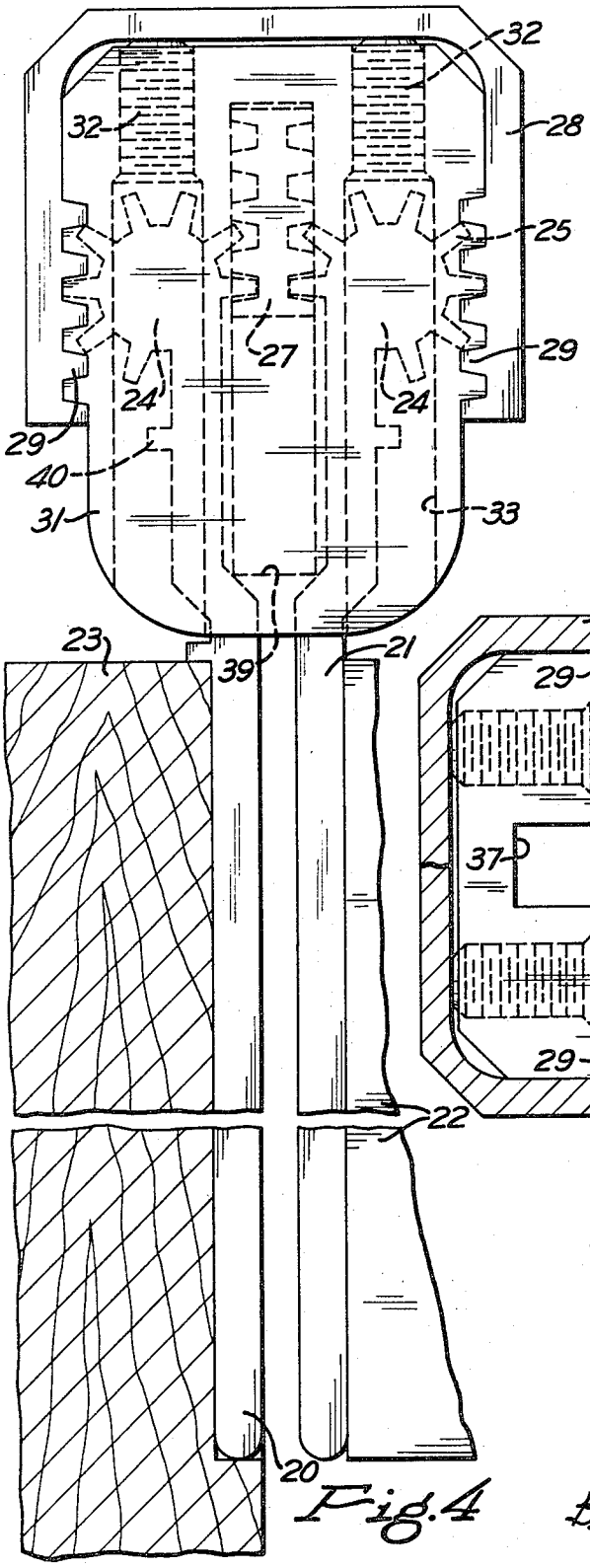


Fig. 4

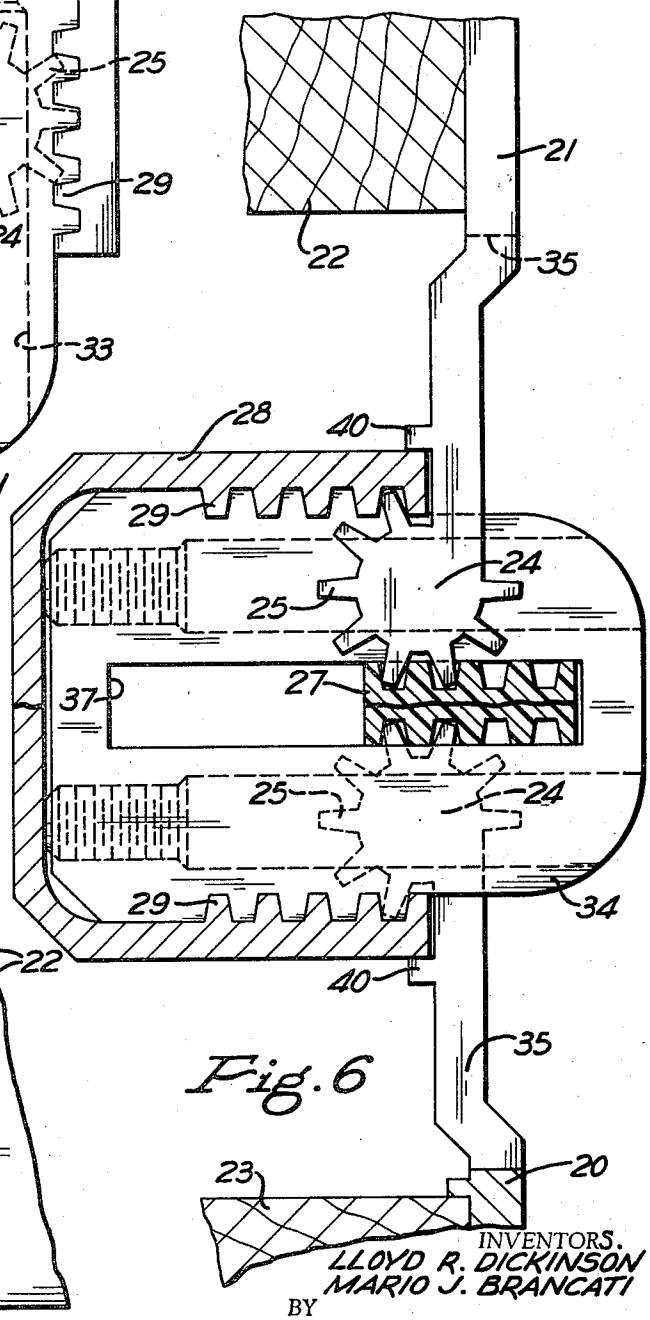


Fig. 6

INVENTORS.
LLOYD R. DICKINSON
MARIO J. BRANCATI

BY

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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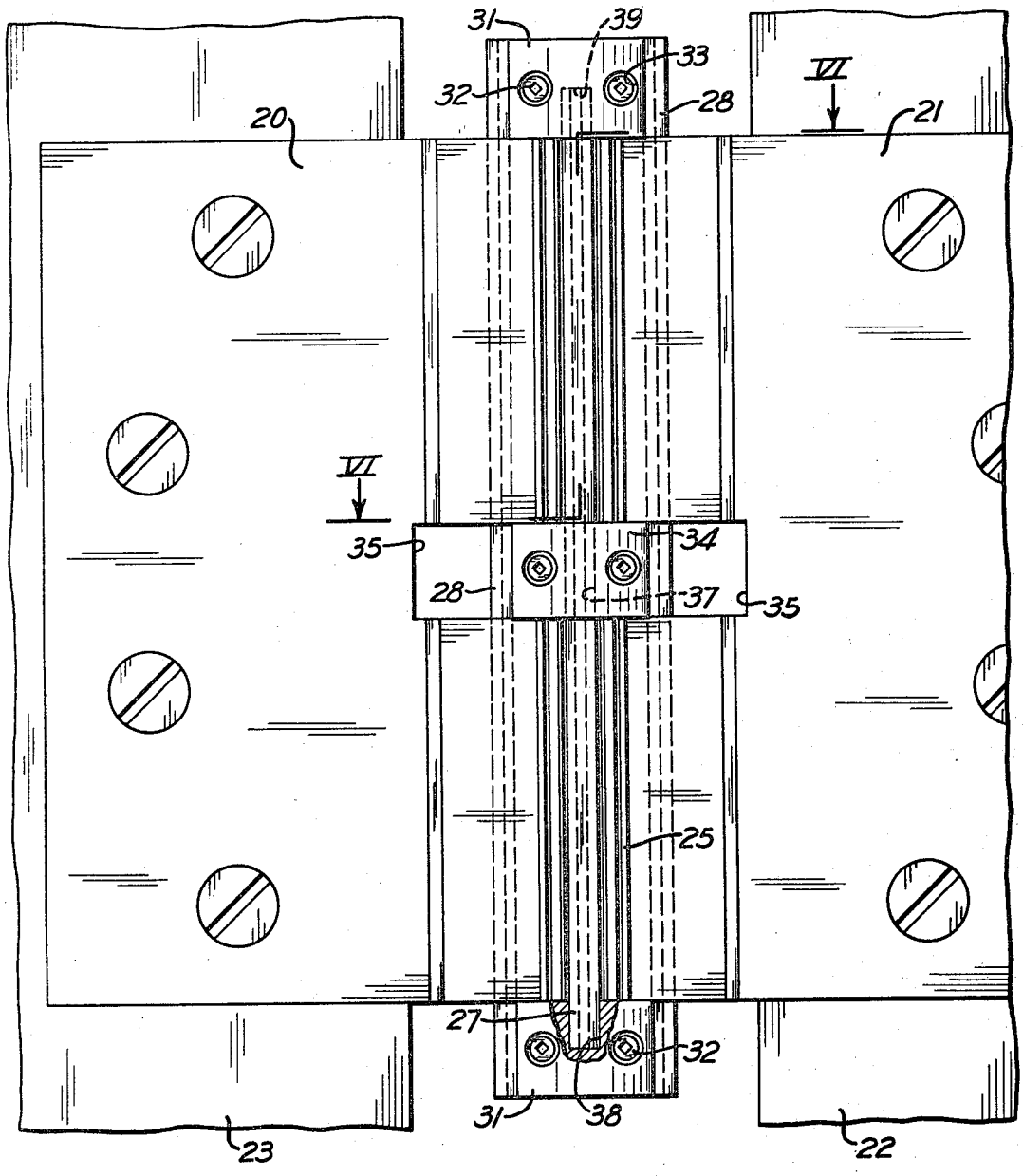


Fig. 5

INVENTORS.
LLOYD R. DICKINSON
MARIO J. BRANCATI

BY

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

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3,422,487

GEARED HINGE WITH FLOATING RACK BAR

Lloyd R. Dickinson, Moscow, and Mario J. Brancati, Scranton, Pa., assignors to McKinney Manufacturing Company, Scranton, Pa., a corporation of Pennsylvania

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Int. Cl. E05d 7/00

ABSTRACT OF THE DISCLOSURE

The two leaves of a hinge turn on spaced parallel axes in a channel member and are provided with gear teeth that mesh with a floating rack bar between them, whereby the bar moves back and forth as the hinge is operated.

A channel member has a web and side flanges, and a pair of opposed hinge leaves extend outwardly away from the open side of the channel. Extending lengthwise along the inner edge of each hinge leaf and joined thereto is a barrel, the two barrels being disposed in the channel between its side flanges, which the barrels rotatably engage. A floating toothed rack bar between the barrels extends lengthwise thereof in engagement with them. The barrels are provided with longitudinal gear teeth meshing with the rack bar, so that when the hinge leaves are swung apart the barrels will move the rack bar away from the channel web. It is an object of this invention to provide a geared hinge, in which the hinge barrel gear teeth do not mesh with each other.

FIG. 1 is a plan view of the hinge connected to a door and door jamb;

FIG. 2 is an elevation with the door open;

FIG. 3 is a fragmentary horizontal section, taken on the line III—III of FIG. 2; and

FIGS. 4, 5 and 6 are views of a modification corresponding, respectively, to FIGS. 1, 2 and 3.

Referring to FIG. 1 of the drawings, two laterally spaced hinge leaves **1** and **2** are shown opposed to each other in substantially parallel relation. In one use of this hinge it is disposed vertically with one leaf attached to a door jamb **3** and the other leaf **2** supporting a door **4** in the door opening. The hinge leaves may be short, or long enough to extend substantially the full height of the door. The two leaves project from one side of the closed door and are joined to transversely arcuate barrels **5**, which extend vertically along the projecting edges of the leaves. The inner surface of each barrel forms more than 180° of a cylinder, but generally less than 270°. The barrels fit part way around a pair of laterally spaced, parallel pivot pins **6**, which are the enlarged, cylindrical, in-turned free edges of a vertical channel **7**.

The channel projects above and below the hinge barrels and is provided at each end with means holding it against vertical movement. Preferably, for this purpose an end cap **10** fits in each end of the channel and projects out of the open side of it across the adjoining ends of the hinge barrels as shown in FIGS. 1 and 2. A set screw **11** threaded in the inner end portion of a horizontal bore **12** in each cap, presses tightly against the web of the channel to hold the end caps in place. A similar member forms a bearing block **13** to help support hinge leaf **2**. As shown in FIGS. 2 and 3, the bearing fits in the channel in the same manner as the end caps and projects out into a pair of gaps **14** formed in the barrels and leaves. The number of bearing blocks used depends on the length of the hinge. The block may be made of a suitable bearing material, preferably a synthetic plastic such as nylon or Teflon.

Inside the channel there is a rack bar **16** that extends lengthwise of the hinge between the barrels. The teeth on the opposite sides of the bar mesh with longitudinal gear teeth **17**, with which the outsides of the barrels are provided. While the door is closed, as shown in FIG. 1, the barrel teeth engage the rack bar farthest from the channel web. The rack bar extends through a slot **18** in bearing block **13**.

It will be seen that in order to open the door; that is, to swing the hinge leaves apart, the rack bar must be able to move forward out of the channel as shown in FIG. 3. To permit this, the slot **18** in the bearing block must extend out into the portion of the bearing that projects from the channel. The rack bar is supported by the lower end cap, and the upper end of the bar substantially engages or slides against the upper end cap. Preferably, the end caps are provided with recesses **19** of substantially the same size and shape as slot **18** in order to receive and guide the opposite ends of the bar as it is moved back and forth when the hinge is operated. The travel of the bar can be limited by the end walls of slot **18** and recesses **19**. One function of the floating rack bar is to prevent metal-to-metal contact of the barrel teeth, which would allow them to wear away fairly rapidly. Therefore, the bar will usually be made of nonmetallic material, such as compressed fiber or a plastic such as nylon, Dacron or Teflon. However, even if the rack bar is made of metal, its use permits the barrel teeth to be positioned in identical positions on both barrels because one barrel does not have to mesh with the other.

It will be seen that when the door **4** that is supported by this hinge is swung open, the barrel **5** attached to the door will rotate around the adjoining pivot pin **6**, and the teeth on that barrel will move the rack bar away from the channel web. This will cause the rack bar to swing around the other barrel so that by the time the door has been opened about 180° as shown in FIG. 3, the rack bar will be in its outermost position and the channel will have turned about 90° from its original position. The hinge leaves may be provided with lugs or ribs **15** that can engage the outer surfaces of the channel flanges to offset any tendency of those flanges to spring apart when the door is swung open 180° rather forcefully.

In the modification shown in FIGS. 4, 5 and 6, the hinge leaves **20** and **21** are connected to the door **22** and the door jamb **23**, respectively, in the same way as before. Likewise, the two leaves project from one side of the closed door and are joined to barrels **24** extending lengthwise along the projecting edges of the leaves. However, in this case the barrels are solid and are provided wtih more gear teeth **25** than the barrels first described. The teeth mesh with the teeth of a rack bar **27** that extends lengthwise of the hinge between the barrels. To hold the barrels against the rack bar, all of them are disposed inside of a vertical channel **28**. The inner sides of the side flanges of the channel are provided with rack teeth **29** that extend lengthwise of the channel and that are engaged by the gear teeth **25**.

The channel projects above and below the hinge leaves and is provided at each end with means holding it against movement lengthwise. Most suitably, end caps **31** that fit in the projecting ends of the channel are used for this purpose. They can be held in place by set screws **32** threaded in the inner end portions of bores **33** through the caps, with the inner ends of the screws pressing tightly against the web of the channel. The end caps project from the open side of the channel above and below the hinge leaves. A bearing block **34**, which is similar in size and shape to the end caps, is mounted in the central portion

of the channel and projects out into a pair of gaps 35 formed in the barrels and hinge leaves.

To permit the door to be opened, the rack bar 27 must be movable away from the channel web and part way out of the channel. The bearing block is provided with a rectangular slot 37, through which the bar extends and which permits the forward and backward movement of the bar. The rack bar is supported by the lower end cap 31, which is provided with a recess 38 (FIG. 5) of substantially the same size and shape as the slot in the bearing block. The lower end portion of the bar is seated in the recess, which helps to guide the bar in its horizontal movements. The upper end portion of the bar may be disposed in a similar recess 39 in the upper end cap.

When the door is swung open, the hinge barrel attached to the door will turn and its teeth will cause the rack bar and the web of the channel to move in opposite directions simultaneously. This will cause the side of the channel closest to the door jamb to swing around the other barrel so that by the time the door has been opened about 180° as shown in FIG. 6, the rack teeth at the outer edges of the channel flanges will be engaging the barrel teeth, and the barrel teeth will be engaging the rack bar teeth near its inner edge. Thus, the channel will have turned about 90° from its original position and the rack bar will project from the channel. As in the first embodiment, the hinge leaves may be provided with stops 40 for engaging the outer faces of the channel flanges when the door is swung wide open.

According to the provisions of the patent statutes, we have explained the principle of our invention and have described what we now consider to represent its best embodiment.

We claim:

1. A hinge comprising a channel having a web and side flanges, a pair of opposed hinge leaves extending outwardly away from the open side of the channel, a barrel extending lengthwise along the inner edge of each hinge leaf and joined thereto, the barrels being disposed in said channel lengthwise thereof between said flanges and rotatably engaging them, and a floating toothed rack bar between the barrels and extending lengthwise thereof in engagement with them, the barrels being provided with longitudinal gear teeth meshing with the rack bar, whereby when said hinge leaves are swung apart the barrels will move the rack bar away from said channel web.

2. A hinge according to claim 1, in which said channel projects beyond the ends of said barrels, end caps fit inside the projecting ends of the channel and contain threaded openings perpendicular to the channel web, set screws in said threaded openings press tightly against said web to lock the caps in the channel, and the end caps project from the open side of the channel to hold said rack bar against substantial longitudinal movement.

3. A hinge according to claim 1, in which said channel projects beyond the ends of said barrels, and end caps rigidly connected to the projecting ends of the channel project from its open side and hold said rack bar against substantial longitudinal movement.

4. A hinge according to claim 3, in which said end caps are provided with recesses receiving the end portions of the rack bar.

5. A hinge according to claim 3, in which said end caps fit inside the projecting ends of the channel.

6. A hinge according to claim 1, in which said barrels and adjoining portions of the hinge leaves have a pair of opposed gaps therein, a bearing fits in said channel and projects out through said gaps and is provided with a slot therethrough containing said rack bar, and means at the ends of said channel hold the bar against substantial longitudinal movement.

7. A hinge according to claim 6, including means rigidly securing said bearing to said channel.

8. A hinge according to claim 1, in which the inner sides of said channel flanges are provided with longitudinal rack teeth meshing with said gear teeth.

9. A hinge according to claim 1, in which the free edges of said channel flanges are in-turned toward each other and are cylindrical to form parallel pivot pins, and said barrels are transversely arcuate and fit only part way around said pivot pins for rotation thereon.

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BOBBY R. GAY, *Primary Examiner.*

DORIS L. TROUTMAN, *Assistant Examiner.*

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49—107; 16—168