

Feb. 24, 1953

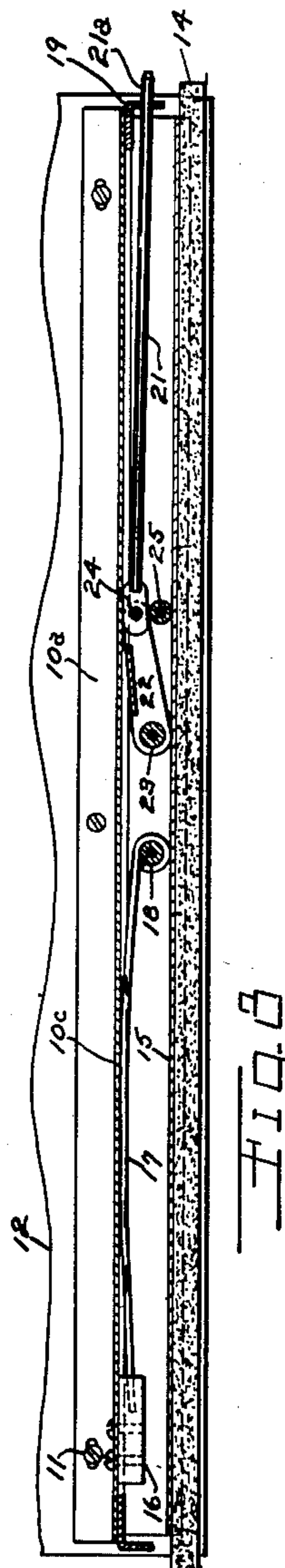
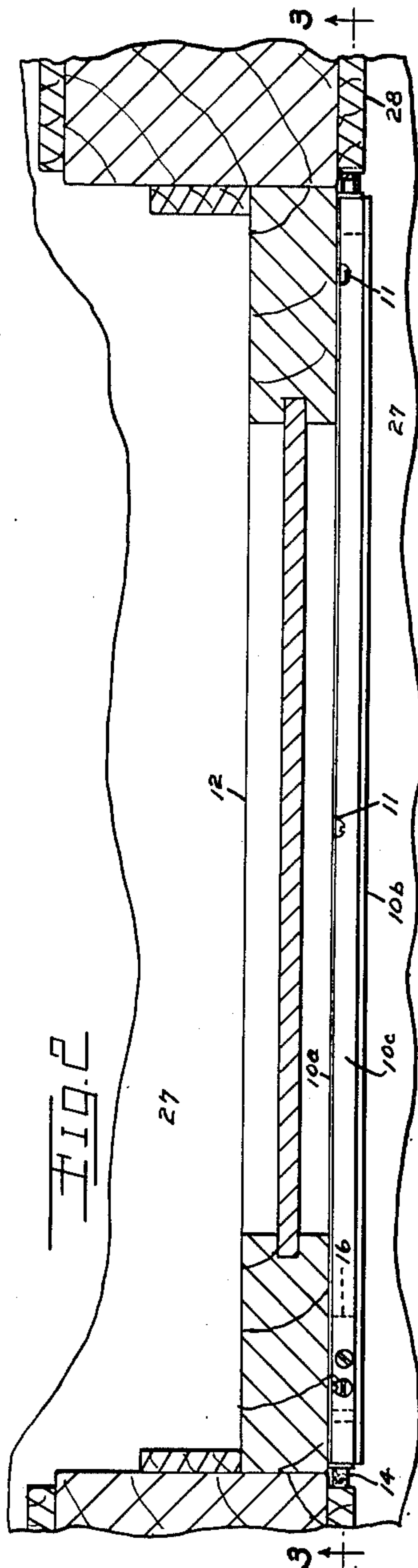
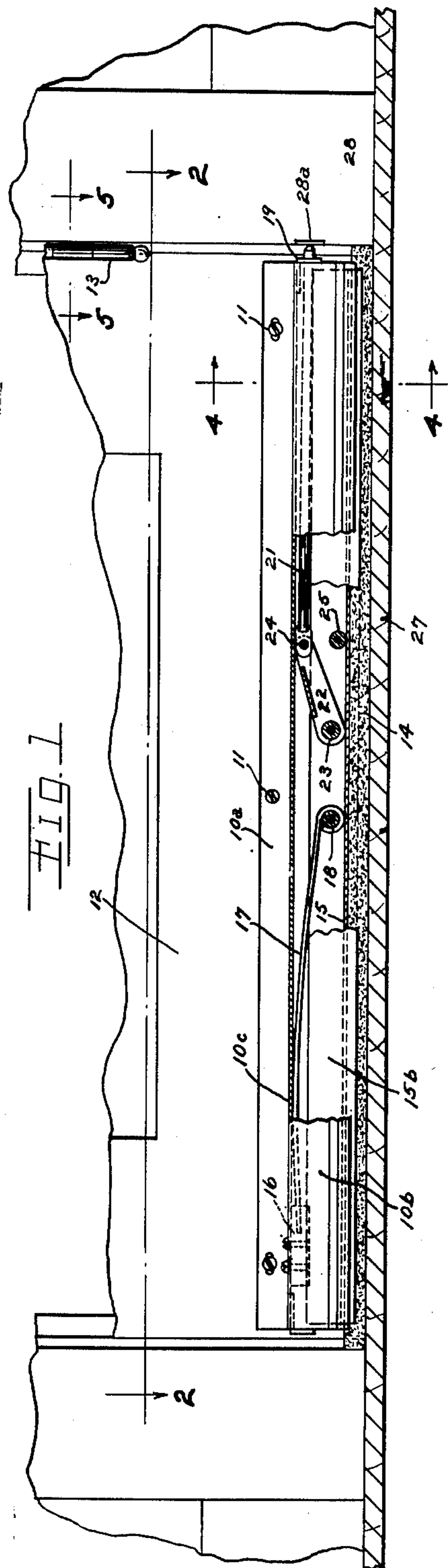
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2,629,147

WEATHER STRIP SEAL FOR DOOR BOTTOMS

Filed Feb. 18, 1950

2 SHEETS—SHEET 1



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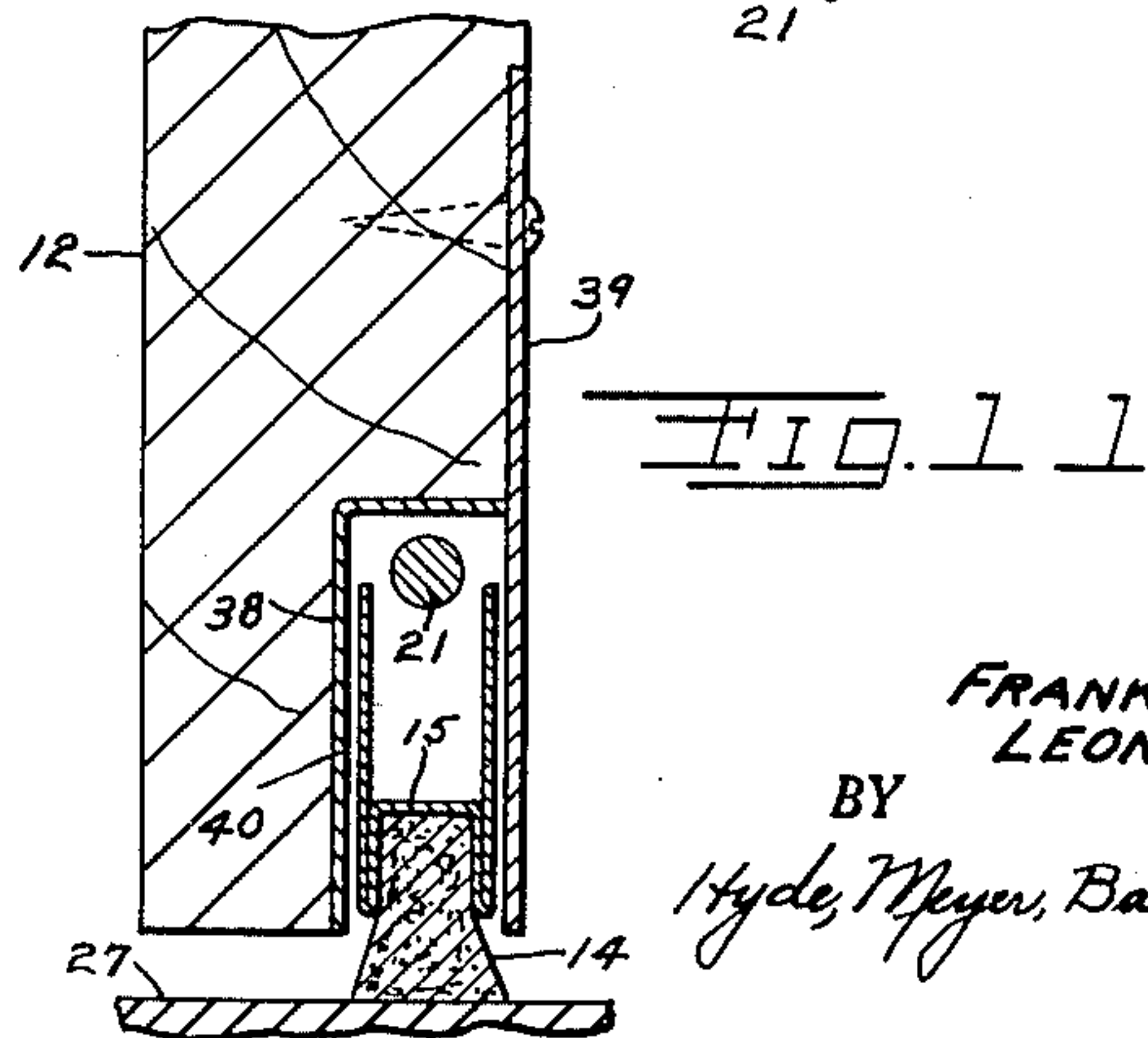
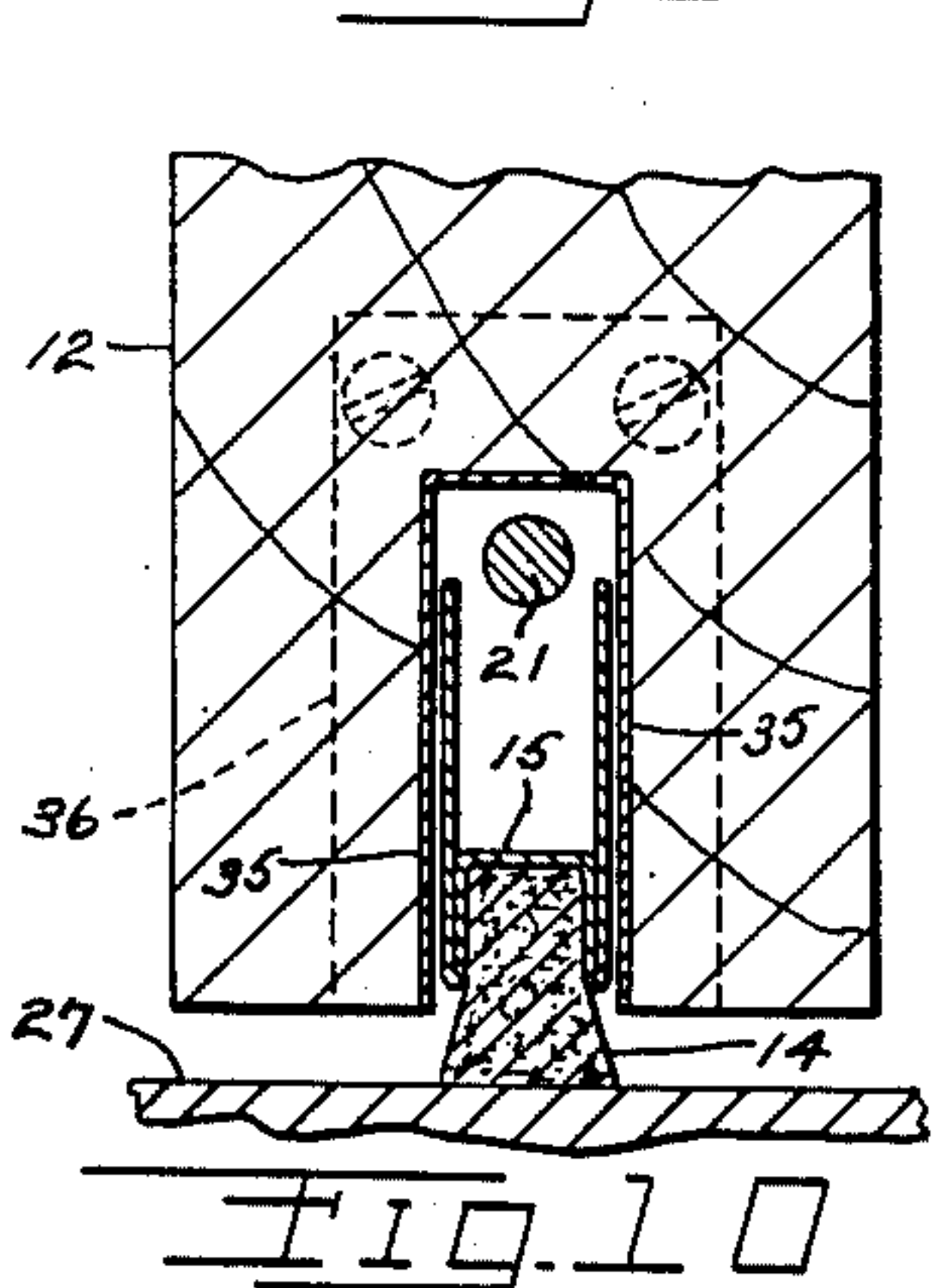
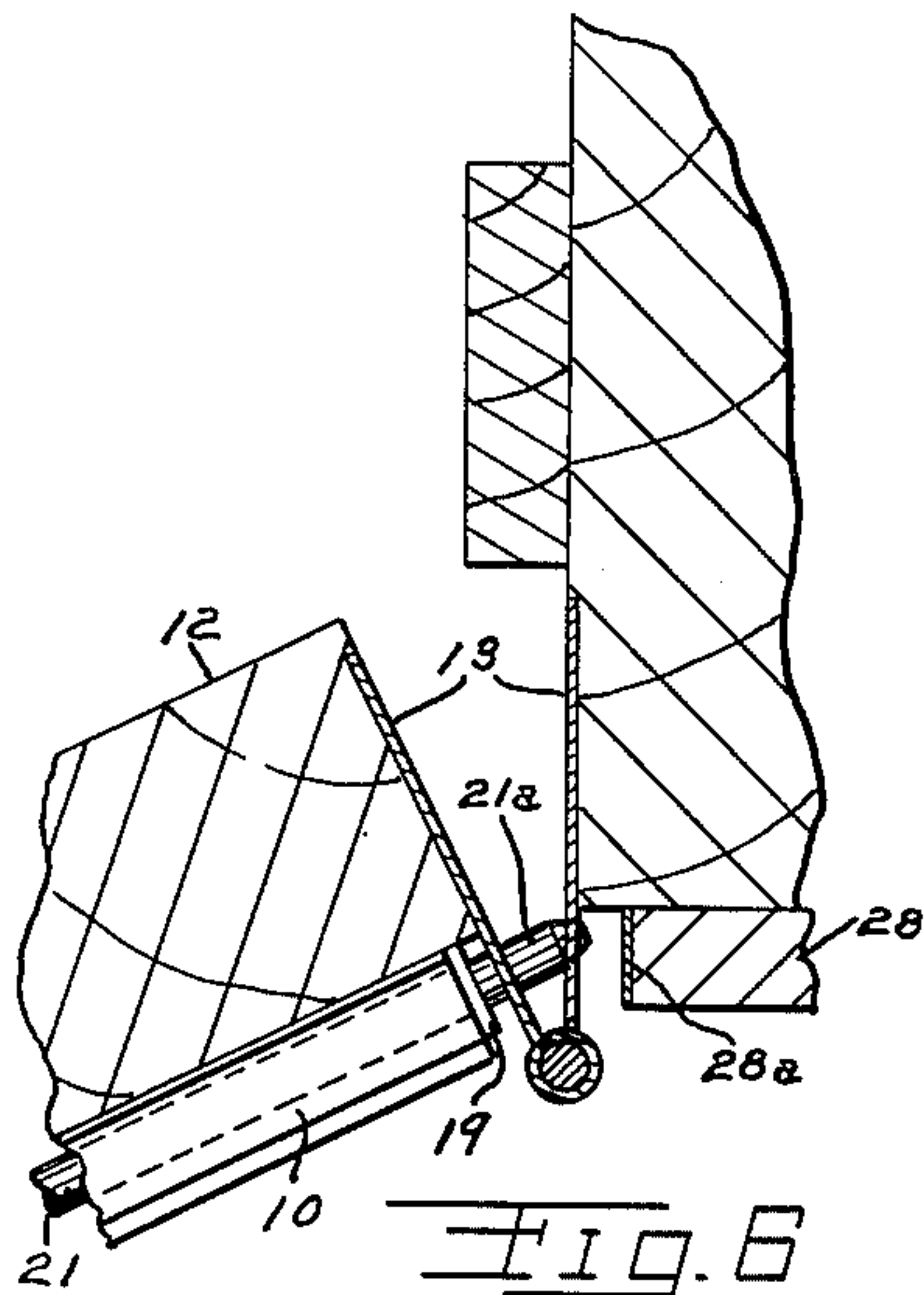
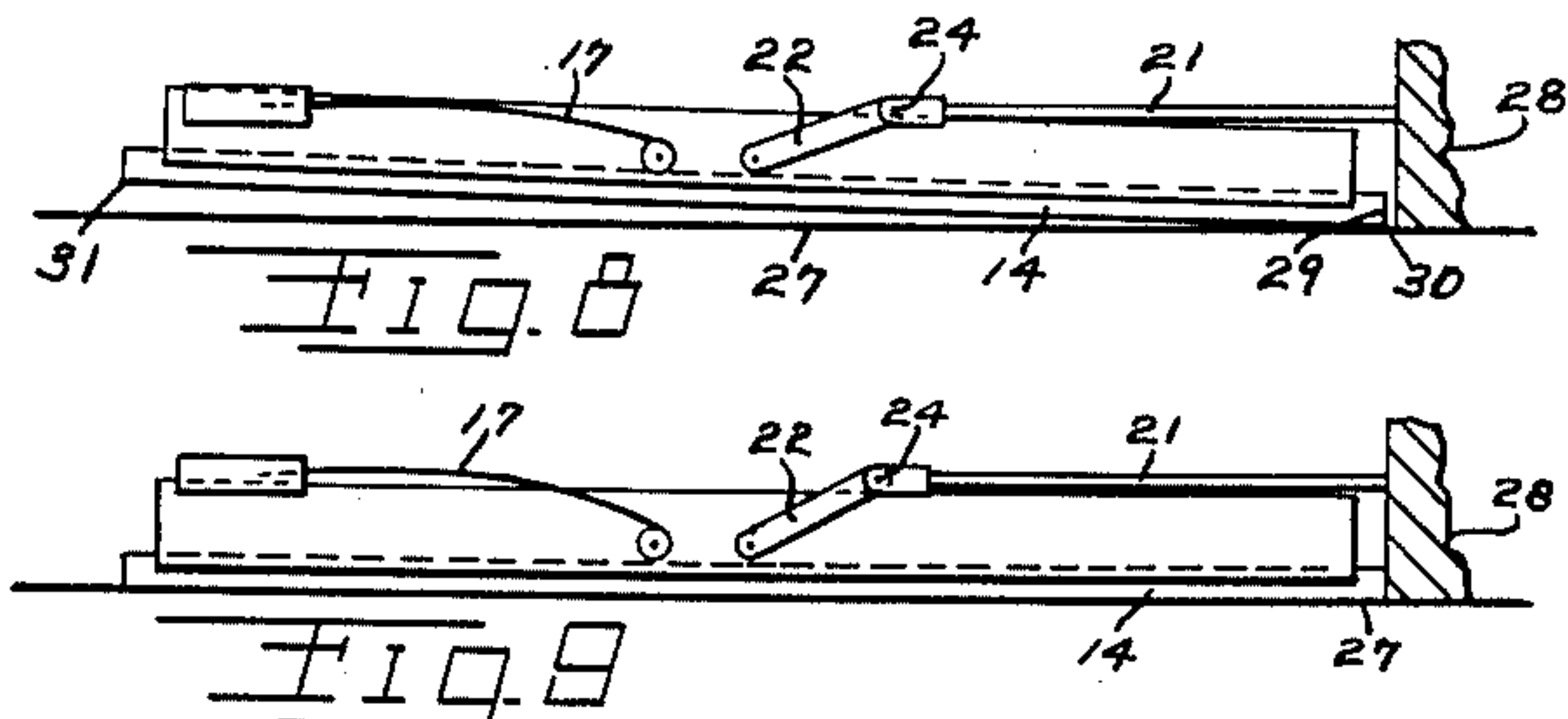
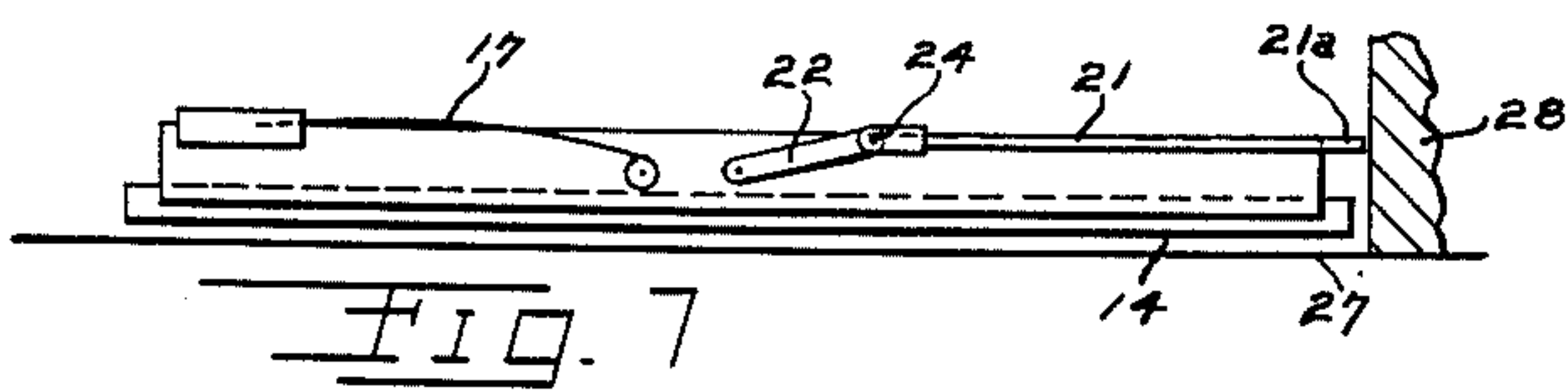
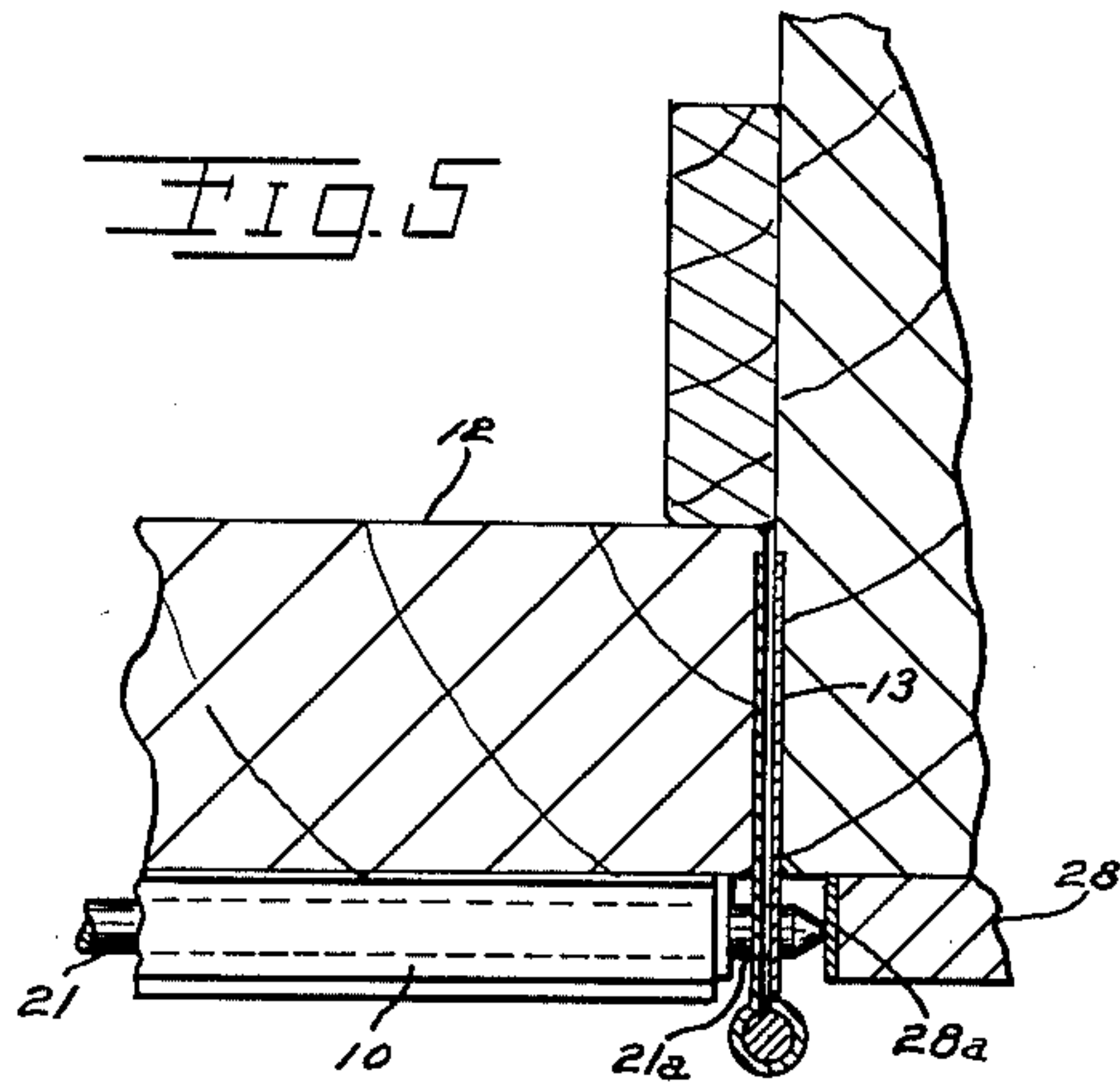
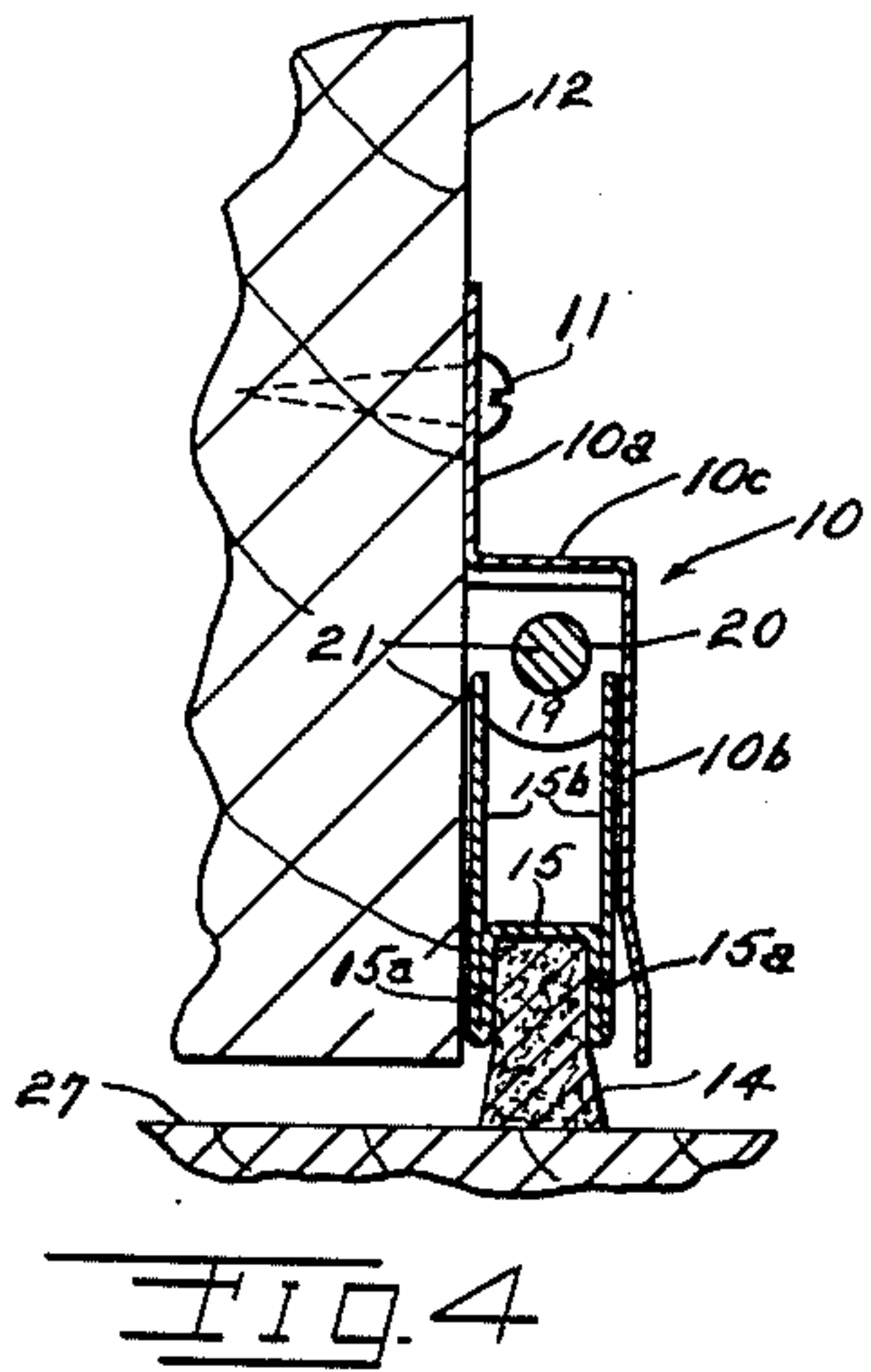
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WEATHER STRIP SEAL FOR DOOR BOTTOMS

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2 SHEETS—SHEET 2



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2,629,147

WEATHER STRIP SEAL FOR DOOR BOTTOMS

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Application February 18, 1950, Serial No. 144,898

8 Claims. (Cl. 20—68)

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The invention relates to weather strips for door bottoms.

The art is familiar with presently available weather strips carried at or adjacent the bottom edge of a door, and movable downwardly to sealing position at the time the door is moved to fully closed position. Certain disadvantages attend the use of weather strip devices so far developed. As will later be more fully explained, these disadvantages in all probability result from the manner in which the sealing strip is suspended, and the defective type of leverage effective on said strip.

An object of the present invention is to devise novel and improved sealing means for a door bottom, said means including novel sealing strip operating leverage and suspension.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevational view of the bottom portion of a door with our novel sealing means attached thereto, parts being broken away and in section to reveal structure normally within a housing:

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view, somewhat enlarged, taken on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view, also somewhat enlarged, taken on the line 5—5 of Fig. 1;

Fig. 6 is a view similar to Fig. 5 but showing the parts in a different working position; and

Figs. 7, 8 and 9 are diagrammatic representations showing successive stages in the operation of our sealing means;

Figs. 10 and 11 are sectional views similar to Fig. 4, but showing several additional embodiments of the invention.

While it will be obvious that the invention now to be described may be applied to any type of closure member, particularly if such member is swingably opened or closed, we have shown the sealing means as applied to a hinged closure of the ordinary door type.

Referring now to the drawings, and particularly to the embodiment shown in Figs. 1 to 6, the sealing means is carried in a Z-shaped housing 10 (Fig. 4) permanently affixed, by screws 11 or otherwise, adjacent the bottom edge of a door 12 which is swingably suspended on hinges 13. The upper leg 10a of the housing forms a convenient attaching flange for the screws. Such installation is frequently preferred since it is more readily removable, for any particular reason, but as will later appear the installation may be a more permanent one of the type wherein the door is pro-

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vided with a downwardly opening recess or groove in its lower edge, and the sealing means may then be suspended in a downwardly opening housing permanently fixed in said groove. As the description proceeds it will appear that the mechanism is readily adaptable to such interior installation, as it might be termed, as well as to the exterior installation shown in the drawings.

The space between the lower vertical wall 10b of the housing, and the lower face edge portion of the door forms a convenient enclosure for the various movable elements of the sealing strip. Such elements include of course the sealing blade 14 and the blade holder 15. The blade may be made of any suitable flexible material such as felt or rubber. The holder can be any rigid material, in this instance a H-shaped sheet metal member having its downwardly extending flanges 15a crimped tightly along the upper edge of blade 14. Insofar as possible, consistent with free operation of the blade, said blade occupies the full lateral extent of the door so as to efficiently seal the space under the door.

The suspension linkage for the sealing blade will now be described. Within housing 10, and near one end thereof, a block 16 is attached to the horizontal portion 10c of the housing wall. The block has a horizontal recess therein opening laterally inwardly, and a bar spring 17 has one end thereof fixedly held therein. The other end of the bar spring encircles a pin 18 which transversely bridges the channel between the upper walls 15b of the blade holder. Pin 18 is near the mid point of the blade holder in the embodiment shown, although as will appear it is spaced at such a point as to predetermine the angular dropping or raising of the sealing strip. The spring 17 is disposed to bias the blade holder to upper or retracted position.

We have provided the following means for forcing the blade and blade holder downwardly to sealing position, against the bias of spring 17, when the door is closed. The end of housing 10 which adjoins the hinged edge of the door has an end wall 19 which might be a bent over tab portion of the metal housing, but in the present instance is an angular member welded to the housing. We might of course provide a plate screwed on the adjacent edge of the door, and perforated to serve as a guide for the outer end of the plunger. Wall 19 has an aperture 20 therein in registry with the upper channel of the blade holder. An operating plunger or push rod 21 has an outer end portion 21a projecting outwardly through aperture 20. The inner end of the plunger is pivotally connected to one end of a link 22, the other end of said link being pivotally connected to a pin 23 which bridges the upper channel of the blade holder. Pin 23 is spaced a substantial distance laterally from pin 18 men-

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tioned hereinabove. In door open position the blade holder 15 and blade 14 are biased to upper position in the housing. The outer end of plunger 21 protrudes beyond wall 19 a distance determined by dimensional characteristics of door and jamb, as will later appear, but for example the outward projection might be about three-quarters of an inch. The inner portion of the plunger, and by far the greater length thereof, extends horizontally in the upper channel of the blade holder, lying adjacent the wall 10c of the housing. The pivot point 24 between the plunger and link 22 is also near the wall 10c of the housing. The pivot point of the other end of the link, which is of course the pin 23, lies at a level below that of the plunger, so that link 22 has a downward inclination from the plunger. A stop member which in this instance is a pin 25 is placed approximately below the pivot point 24. It does not interfere with lateral motion of plunger 21, but it prevents downward "over center" buckling of pivot 24.

In certain respects the device just described operates as did previous sealing strips of this general nature. When the door is moved towards closed position the end 21a of plunger 21 makes initial contact with the door jamb and continued closing motion of the door pushes the plunger further and further inwardly. The pivot point 24 moves inwardly, to the left in Figs. 1 to 3, and the pivot point 23, to relieve the stress set up in the system, moves downwardly carrying the blade holder and blade downwardly against the bias of spring 17. Instead of abutting the jamb directly, the plunger may contact some harder abutment such as a metal strike plate 28a although a simple flat headed screw may be inserted at the point of contact of the plunger and jamb which will be substantially wearproof.

This operation, as described in the immediately preceding paragraph, was characteristic of previously known sealing members. All such previously known devices had as their professed purpose the movement of the blade downwardly while maintaining it substantially parallel to the floor until full sealing contact was obtained and further closing movement merely increased the sealing pressure on the blade.

One of the more obvious disadvantages of this structure and function was the fact that before the door was entirely shut the blade dragged on the floor (and especially on a carpeted floor or a raised threshold portion) throughout its full length, setting up considerable frictional resistance, with consequent lateral stresses on the blade, the suspension elements, and the housing. Interfitting parts were loosened, members were bent, the operation became inaccurate and noisy, and the sealing became more and more inefficient. As a result of our study of prior structures we eventually concluded that the parallel approach was undesirable, and after further study we discovered that a more efficient operation could be obtained by spacing the inner connection point 13 of the spring from the inner pivot point 23 of link so as to effect a transfer of the fulcrum point of the leverage system at an intermediate time in the operation.

The novel operation of our device will be apparent from a study of Figs. 7, 8 and 9, wherein the essential parts are shown diagrammatically, using the same reference characters as in the other drawings, wherever possible.

Fig. 7 shows the parts in door-open position. Plunger 21 is fully outwardly extended, and blade

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14 is upwardly retracted. The floor level is indicated by line 27.

As the door approaches the jamb 28, and the tip 21a of the plunger makes contact with the jamb, and is forced partially inwardly as shown in Fig. 8, the resistance of spring 17 to the horizontal moment of compression induces a downward swing of link around pivot 24, with a consequent swing downwardly of the end 29 of blade 14. This end of the blade, being closely adjacent jamb 28, is usually clear of any carpeting on the floor, and in any event continued travel of the door produces only a dragging movement of one corner of the blade with only an inconsequential amount of friction. As a matter of fact contact even of one corner of the blade is restricted to a very short space of travel during opening or closing door movement.

For further inward motion of the plunger the point 30 of the blade which is in contact with the floor assumes the function of a fulcrum, and as the plunger 21 continues to be pressed inwardly by movement of the door to fully closed position, the end 31 of the blade which is furthest from jamb 28 swings downwardly around point 30 as a pivot. As the angle between the blade and the floor closes, the zone of the blade where the greatest frictional resistance would normally be encountered, namely near the end 31, is the zone which remains longest out of contact with the floor or carpet. The manner of operation of the device is accordingly best calculated to avoid frictional drag, and the leverage causes excellent sealing contact between the blade and the floor in the door-closed position.

Fig. 10 shows a slightly modified adaptation of the invention wherein an internal, downwardly opening groove extends along the bottom edge of the door 12. In this case, instead of a Z-shaped housing, the groove may be provided with an inverted U-shaped lining 35, the operating elements being otherwise identical with the embodiment previously described. The ends of the groove may be finished by applying thereto cover plates 36, the plate at the plunger end being perforated to permit the plunger to extend there-through.

Fig. 11 shows another embodiment in which the door is provided, along its bottom inner or outer face with a rabbeted groove 33 faced preferably by a rustproof kick plate 39, the groove and kick plate together forming a protective housing in which the heretofore described operating elements function as before. The rabbeted groove may have a protective lining 40 in the form of an angular member of sheet metal.

The operation of the blade as just described has been likened by observers to the action of the foot as a pedestrian walks briskly around a corner or a sharp curve. The heel makes contact first with the ground and the angle between the shoe sole and the heel thereafter decreases to full contact. At the same time, as the pedestrian's weight moves forward, his body turns in the movement around the corner so that the shoe pivots laterally as well as downwardly.

The operation of our novel sealing means, as will readily be understood, also prevents undue scuffing and wear on carpets or other floor coverings, and the mechanism is smooth and quiet in operation.

The lengths of the plunger, the link, and the spring, and the location of the various support and pivot points as shown in the drawings, may be regarded as representative of a preferred em-

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bodiment. It will be apparent to those skilled in the art that changes in the just mentioned structural dimensions and features can be made to accommodate varying conditions of use.

In actual conditions of use the relationship between points 13 and 23 can remain the same on all doors up to about 36" in width and without any change in the position of the spring holding member 16, or in the length of the push rod, but in sizes above about 36" we prefer to supply a longer push rod, and to reposition block 16. With some very minor changes, the structure illustrated may be quickly adapted to a door in which the hinge is on the opposite side from that shown herein. The plunger 21 may also be made adjustable in length, so as to assure a positive and accurate operation with doors and door jambs of variable dimensional relationships.

The sealing blade 14 may be mechanically gripped by the downwardly extending flanges 15a of holder 15, although we prefer to cement the blade in position by means of some reliable type of adhesive. Wherever we refer herein, or in the appended claims, to the blade being "gripped" by the holder, it is to be understood that the expression comprehends any suitable means of holding the blade, mechanical or otherwise.

The sealing member 14 has been herein termed for convenience, a "blade." It will be understood that the term includes any elongated, resilient member having characteristics such that it adequately closes and seals the normally open space beneath a movable closure member.

While we have discussed our invention particularly in connection with ordinary doors, the structure is of course applicable to screen doors, storm doors, and other types of closure.

What we claim is:

1. A weather strip device for door bottoms, comprising an elongated housing member adapted for attachment to a lower portion of a door and having a bottom opening, a holder provided with a sealing member mounted in said housing with said sealing member suspended for movement downwardly out of and upwardly into said housing, a resilient biasing member rigidly secured at its outer end to the housing and having its inner end pivoted at a first connection point on said holder, and biasing the holder upwardly, and means for moving said holder downwardly comprising a rigid plunger movable horizontally in said housing and having an outer free end extendable out of said housing the inner end of said plunger slidably abutting the inner upper wall face of said housing, a rigid link within said housing having one end pivotally connected to the inner end of said plunger and the other end pivotally connected to a second connection point on said holder, whereby closing movement of said door causes contact of the outer end of said plunger with a door jamb whereby to produce downward angular movement of said holder in said housing.

2. A weather strip device as defined in claim 1, and wherein said rigid link is inclined downwardly towards said second connection point and inwardly towards but not reaching said first connection point, and wherein means is provided for preventing downward movement of said plunger when it is moved inwardly in said housing.

3. A weather strip device as defined in claim 1 and wherein said first and second connection points lie below a horizontal plane passing

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through the plunger and the fixed end of the biasing member.

4. A weather strip device for door bottoms, comprising an elongated housing member adapted for attachment to a lower portion of a door and having a bottom opening, a holder mounted in said opening, said holder being of H-shaped cross-sectional contour and having a pair of downwardly extending flanges and a pair of upwardly extending flanges, said downwardly extending flanges having a resilient sealing strip gripped therebetween, means for normally biasing said holder upwardly in said housing comprising an elongated resilient member rigidly secured at its outer end to the housing, a first cross pin bridging the space between said upwardly extending flanges, the inner end of said resilient member being pivotally secured to said first cross pin, means for moving said holder downwardly comprising a rigid plunger extending and movable horizontally in the space between said upwardly extending flanges and having an outer end thereof projecting outwardly from said housing and having an inner end slidably abutting the inner upper wall face of said housing, a rigid link movable within the space between said upwardly extending flanges, said link having one end thereof pivotally connected to said plunger, a second cross pin bridging the space between said upwardly extending flanges, the other end of said link being pivotally connected to said second cross pin whereby, when said plunger is moved horizontally inwardly by closing movement of said door, said holder is forced downwardly angularly in said housing to first produce contact of one end only of said sealing strip with the floor, and thereafter line contact of the whole strip with the floor.

5. A weather strip device as defined in claim 4, wherein the link is inclined downwardly from its pivotal connection of the resilient member with said first cross pin.

6. A weather strip device as defined in claim 4, wherein said first and second cross pins are located below a horizontal plane intersecting the plunger and the point of connection of the resilient member with the housing.

7. A weather strip device as defined in claim 1 and wherein said door has an internal, downwardly opening groove extending along its lower edge and said housing is affixed within said groove.

8. A weather strip device as defined in claim 1, and wherein said door has a rabbeted groove extending along the lower edge face of a door, and said housing is attached within said groove.

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