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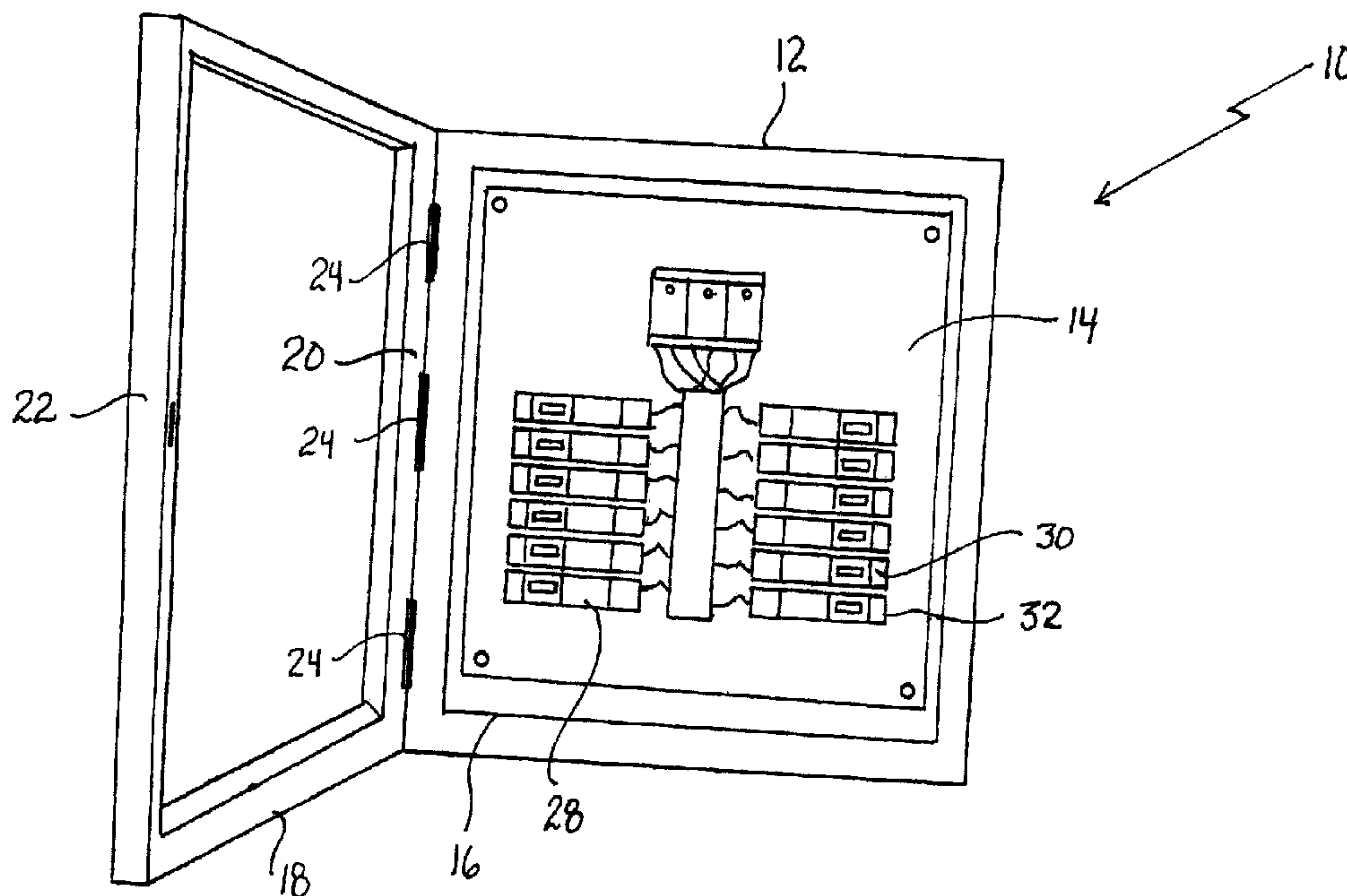
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(54) Titre : COFFRET DE DISJONCTEURS POUR MILIEUX DANGEREUX

(54) Title: A CIRCUIT BREAKER PANEL FOR HAZARDOUS ENVIRONMENTS



(57) Abrégé/Abstract:

In a die clamping apparatus for an injection molding machine or the like, die clamping means for coupling and pressing a moving die plate 9 to a fixed die plate via a tie bar 15 has a die clamping cylinder consisting of two stages of a large-diameter cylinder 11 and a small-diameter cylinder 31 and a ram formed into two stages of a large-diameter ram 13 and a small-diameter ram 25. The large-diameter ram 13 is inserted in the large-diameter cylinder 11, and the small-diameter ram 25 is inserted in the small-diameter cylinder 31. The proximal end portion of the tie bar 15 is connected directly to the small-diameter ram 25. Large oil chambers 11c and 11d are provided on both sides of the large-diameter ram 13, and a small oil chamber 11e is provided on the tie bar connection side of the small-diameter ram 25. An oil pressure is supplied appropriately to each of the large oil chambers and the small oil chamber in the die clamping cylinder to appropriately move the tie bar 15. The apparatus constructed as described above can be manufactured at a low cost, and useless time for eliminating a gap between a ring grooves in the tie bar and an engagement teeth of half nuts caused by the adjustment to die thickness can be reduced.



ABSTRACT

In a die clamping apparatus for an injection molding machine or the like, die clamping means for coupling and pressing a moving die plate 9 to a fixed die plate via a tie bar 15 has a die clamping cylinder consisting of two stages of a large-diameter cylinder 11 and a small-diameter cylinder 31 and a ram formed into two stages of a large-diameter ram 13 and a small-diameter ram 25. The large-diameter ram 13 is inserted in the large-diameter cylinder 11, and the small-diameter ram 25 is inserted in the small-diameter cylinder 31. The proximal end portion of the tie bar 15 is connected directly to the small-diameter ram 25. Large oil chambers 11c and 11d are provided on both sides of the large-diameter ram 13, and a small oil chamber 11e is provided on the tie bar connection side of the small-diameter ram 25. An oil pressure is supplied appropriately to each of the large oil chambers and the small oil chamber in the die clamping cylinder to appropriately move the tie bar 15.

The apparatus constructed as described above can be manufactured at a low cost, and useless time for eliminating a gap between a ring grooves in the tie bar and an engagement teeth of half nuts caused by the adjustment to die thickness can be reduced.

TITLE OF THE INVENTION:

A Circuit Breaker Panel For Hazardous Environments

FIELD OF THE INVENTION

5 The present invention relates to a circuit breaker panel for hazardous environments and, more particularly, Class 1, Division 2 environments.

BACKGROUND OF THE INVENTION

10 In North America, hazardous environments fall into different categories. Class 1 Division 1 covers hazardous environments in which a hazard, such as an explosive gas, is continuously or frequently present. Class 1 Division 2 covers hazardous environments in which the hazard potentially can be,
15 but is only rarely, present. An arbitrary threshold level has been established of less than 10 hours a year, which serves as the dividing line between Division 1 and Division 2.

 In Division 1 environments, circuit breaker panels are
20 used which have explosion proof housings made from cast aluminum with specific tolerances engineered to contain any explosion. A flange is provided around an access opening to the housing. A closure door is secured by dozens of bolts to the flange, in order to prevent the closure door from being
25 blown off the housing by the explosion. The width of the flange is selected so that any hot gases escaping past the flange have cooled sufficiently to avoid igniting gases in the outside environment by the time they exit the housing. The weight of these explosion proof housings vary with their size,
30 but in all cases they weigh hundreds of pounds and a support structure must be provided that can support such weight. In view of this approach North American Division 1 circuit breaker panels are expensive and cumbersome to access.

35 Europe has adopted similar categories to Division 1 and Division 2, which are termed "Zone 1" and "Zone 2". Their Zone 1 standards are more stringent. Each electrical component must

have its own self contained explosion proof casing. These explosion proof electrical components are placed into carbon impregnated enclosures which can be grounded. They use multiple housings which are assembled in a modular fashion.

5 The European Zone 1 circuit breaker panels are even more expensive than those used in North America. European Zone 2 installations use the same circuit breaker panels as are used for Zone 1.

10 In an effort to address the above described problems with expense and access, there has been a movement to use two panels in tandem in North American Division 2 environments. One panel has a housing which is not explosion proof and the other panel has an explosion proof housing. Only those circuit breakers
15 and other electrical components which may cause arcing or sparking during the course of their operation, are placed into the explosion proof housing. Providing two housings reduces access problems, as only circuit breakers and other arcing and sparking electrical components must be isolated within the
20 explosion proof housing. It does not, of course, reduce the size and space requirements as two housings are used.

Although using one explosion proof panel and one panel that is not explosion proof has reduced expense and access
25 problems, the industry is still looking for a better approach to Division 2 circuit breaker panels.

SUMMARY OF THE INVENTION

What is required is an alternative circuit breaker panel
30 for Division 2 hazardous environments.

According to the present invention there is provided an circuit breaker panel for hazardous environments and, in particular, Class 1, Division 2 environments. The circuit
35 breaker panel includes a housing having an internal cavity and an access opening through which the internal cavity is accessed. A closure door covers the access opening of the

housing. The closure door is held in a closed position solely by one or more latches. This permits rapid access to be obtained to the internal cavity through the access opening. Electrical components are positioned within the internal cavity of the housing, some of the electrical components being circuit breakers. Each of the circuit breakers and all other arcing and sparking electrical components are enclosed in its own self contained explosion proof casing.

10 The circuit breaker panel, as described above, meets the safety requirements for Class 1 Division 2, while dramatically reducing costs and enhancing ease of access. The housing is not explosion proof and, as such, is light weight. This makes the cost of manufacture less and also results in savings for 15 the support structure required to mount the housing. The closure door can either be hinged and latched or can be made removable and latched. The use of latches dramatically enhances ease of access. There is no need to separate electrical components by placing circuit breakers and all other 20 arcing and sparking components into an explosion proof housing and all other electrical components into a housing that is not explosion proof; as the circuit breakers and the arcing and sparking components are, themselves, explosion proof.

25 **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit 30 the scope of the invention to the particular embodiment or embodiments shown, wherein:

FIGURE 1 is a perspective view of a circuit breaker panel for hazardous environments constructed in accordance with the teachings of the present invention.

35 **FIGURE 2** is a front elevation view, in section, of the circuit breaker panel illustrated in **FIGURE 1**.

FIGURE 3 is a top plan view of the circuit breaker panel

illustrated in **FIGURE 1**.

FIGURE 4 is a side elevation view, in section, of the circuit breaker panel illustrated in **FIGURE 1**.

5 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

The preferred embodiment, a circuit breaker panel for hazardous environments generally identified by reference numeral 10, will now be described with reference to **FIGURES 1** through **4**.

10

Structure and Relationship of Parts:

Referring to **FIGURE 1**, there is provided a circuit breaker panel 10 that includes a rectangular housing 12. Housing 12 is preferably made from metal or fibreglass. Referring to
15 **FIGURE 3**, housing 12 has an internal cavity 14 and an access opening 16 through which internal cavity 14 is accessed. A closure door 18 covers access opening 16 of housing 12. Referring to **FIGURE 1**, closure door 18 has a first side edge 20 and a second side edge 22. Closure door 18 is pivotally
20 mounted to housing 12 for pivotal movement between an open position and a closed position by hinges 24 that are positioned along first side edge 20.

Referring to **FIGURE 4**, a latch 26 is positioned along second side edge 22. Closure door 18 is held in the closed
25 positioned solely by latch 26, whereby rapid access is obtained to internal cavity 14 through access opening 16. Referring to **FIGURE 3**, electrical components 28 are positioned within internal cavity 14 of housing 12. Referring to **FIGURE 2**, some of electrical components 28 are circuit breakers 30. Each of
30 the circuit breakers 30 and all other arcing and sparking electrical components is enclosed in its own self contained explosion proof casing 32. Referring to **FIGURE 3**, a power distribution bus or block 38 is positioned between circuit breakers 30. Referring to **FIGURE 4**, housing 12 has mounting
35 tabs 34 for mounting circuit breaker panel 10 to a surface 36.

Operation:

The use and operation of circuit breaker panel for hazardous environments generally identified by reference numeral 10, will now be described with reference to **FIGURES 1** through **4**. Referring to **FIGURE 1**, circuit breaker panel 10 is provided as described above. When access to electrical components 28 is required, closure door 18 is unlatched from housing 12, and pivoted to the open position. Electrical components 28, including circuit breakers 30 contained within housing 12 can then be accessed through access opening 16 of housing 12. When access is not required, closure door 18 is pivoted to the closed position, and latch 26 is activated to maintain closure door 18 in the closed position. In the event of an explosion within housing 12, an explosion within one of circuit breakers 30 will be contained within their own explosion proof casing 32 within housing 12.

Variations:

Instead of a latch, relatively rapid access may still be maintained by having four or six screws securing closure door 18 in the closed position.

In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the invention as hereinafter defined in the Claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

5 1. A circuit breaker panel for hazardous environments, comprising:

a housing having an internal cavity and an access opening through which the internal cavity is accessed;

10 a closure door covering the access opening of the housing, the closure door being held in a closed position by not more than a few fasteners, whereby rapid access is obtained to the internal cavity through the access opening; and

15 electrical components positioned within the internal cavity of the housing, some of the electrical components being circuit breakers, each of the circuit breakers and all other arcing and sparking electrical components being enclosed in its own self contained explosion proof casing.

20 2. The circuit breaker panel as defined in Claim 1, wherein the fasteners are screws.

3. The circuit breaker panel as defined in Claim 2, wherein there are between four and six screws.

25 4. The circuit breaker panel as defined in Claim 1, wherein the fasteners include at least one latch.

30 5. The circuit breaker panel as defined in Claim 4, wherein the closure door has a hinge along a first side edge, the closure door being mounted to the housing by the hinge for pivotal movement between an open position and the closed position, the at least one latch being positioned along a second side edge in order to maintain the closure door in the closed position.

35

6. The circuit breaker panel as defined in Claim 1, wherein the housing is made from metal.

7. The circuit breaker panel as defined in Claim 1, wherein the housing is made from fibreglass.

8. A circuit breaker panel for hazardous environments, comprising:

5 a rectangular housing having an internal cavity and an access opening through which the internal cavity is accessed;

a closure door covering the access opening of the housing, the closure door having a first side edge and a second side edge, the closure door being pivotally mounted to the housing for pivotal movement between an open position and a closed position by a hinge positioned along the first side edge;

10 at least one latch positioned along the second side edge, the closure door being held in the closed position solely by at least one latch, whereby rapid access is obtained to the internal cavity through the access opening; and

15 electrical components positioned within the internal cavity of the housing, some of the electrical components being circuit breakers, with each of the circuit breakers and all other arcing and sparking electrical components being enclosed in its own self contained explosion proof casing.

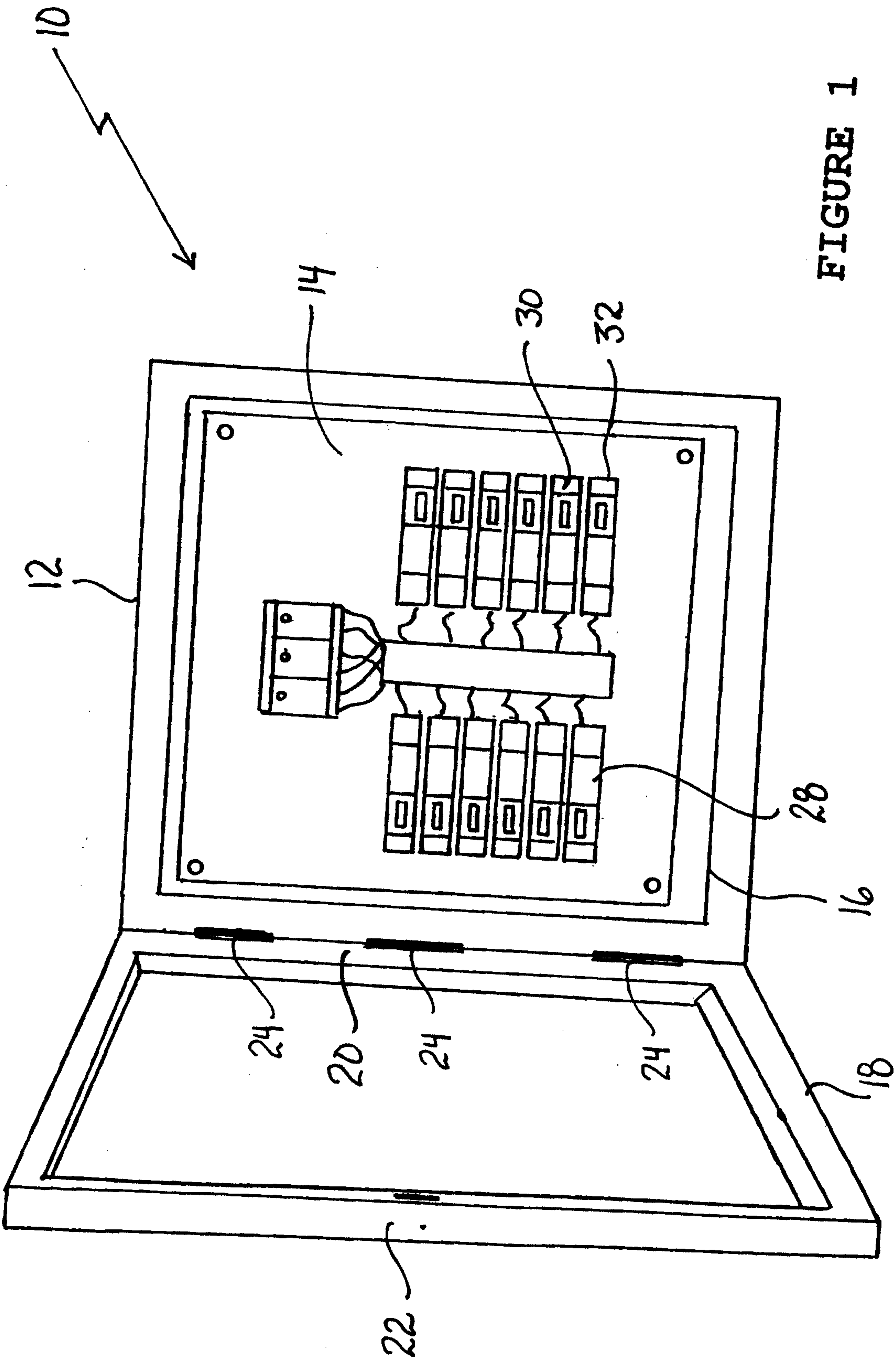


FIGURE 1

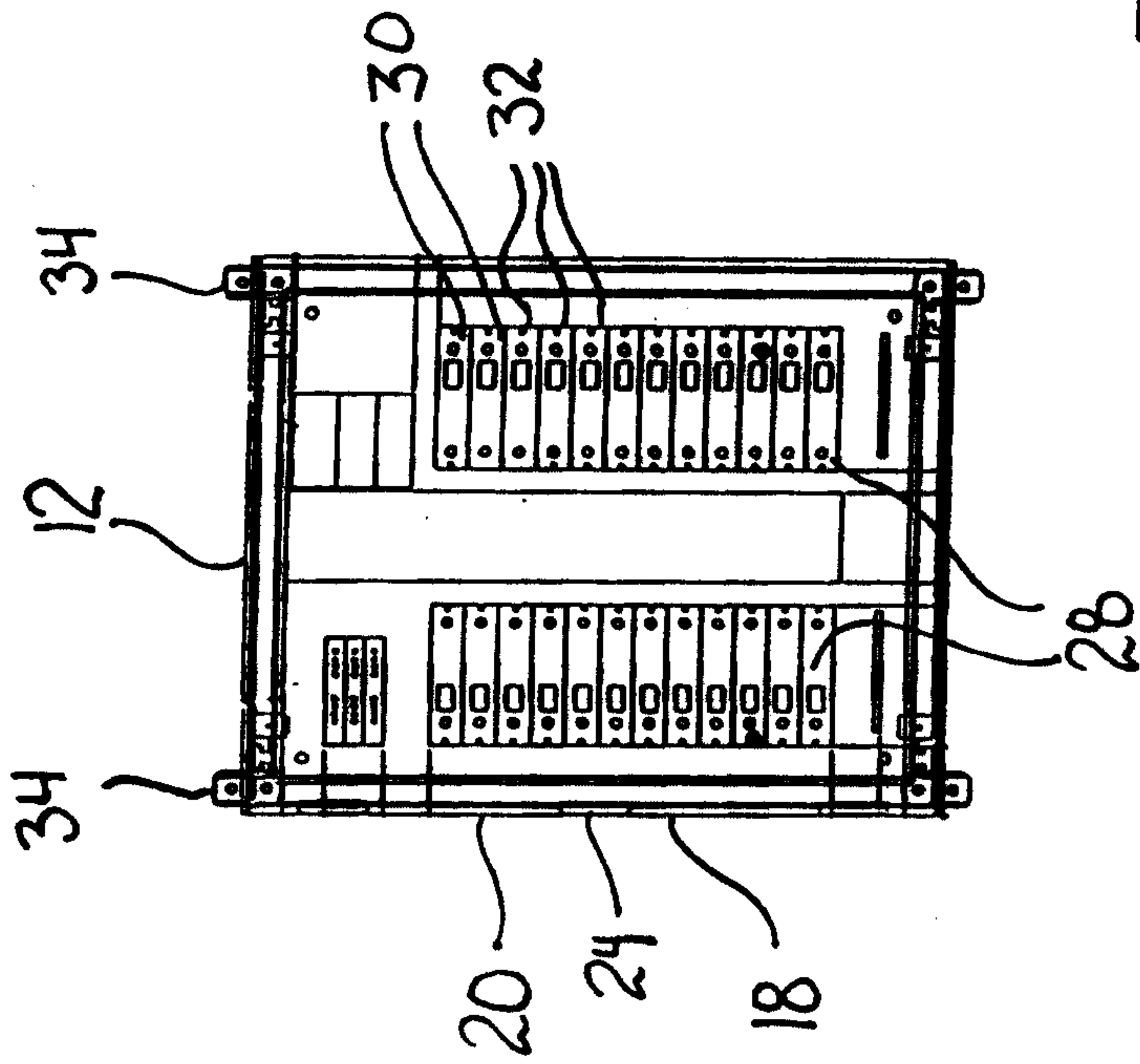


FIGURE 2

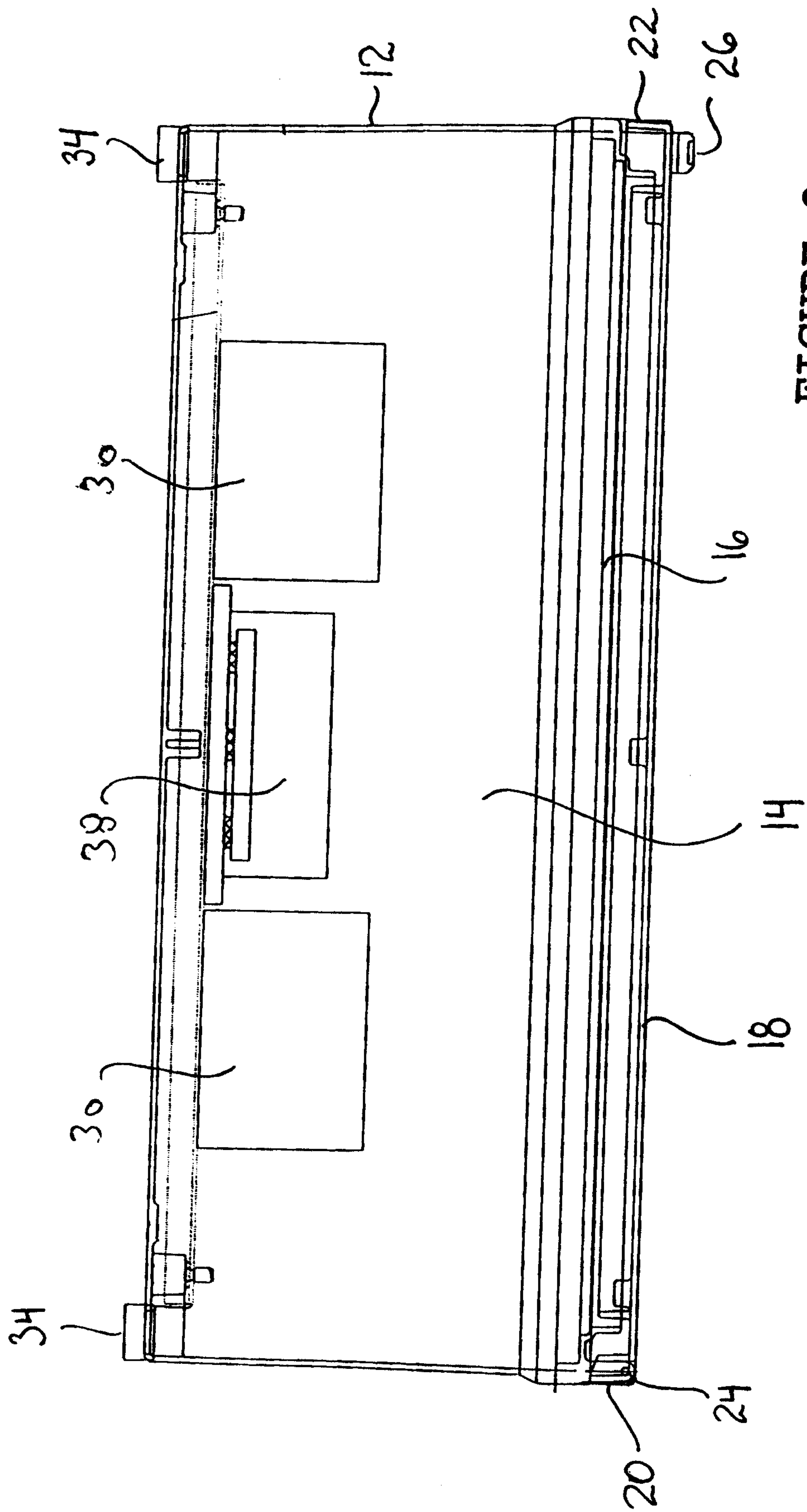


FIGURE 3

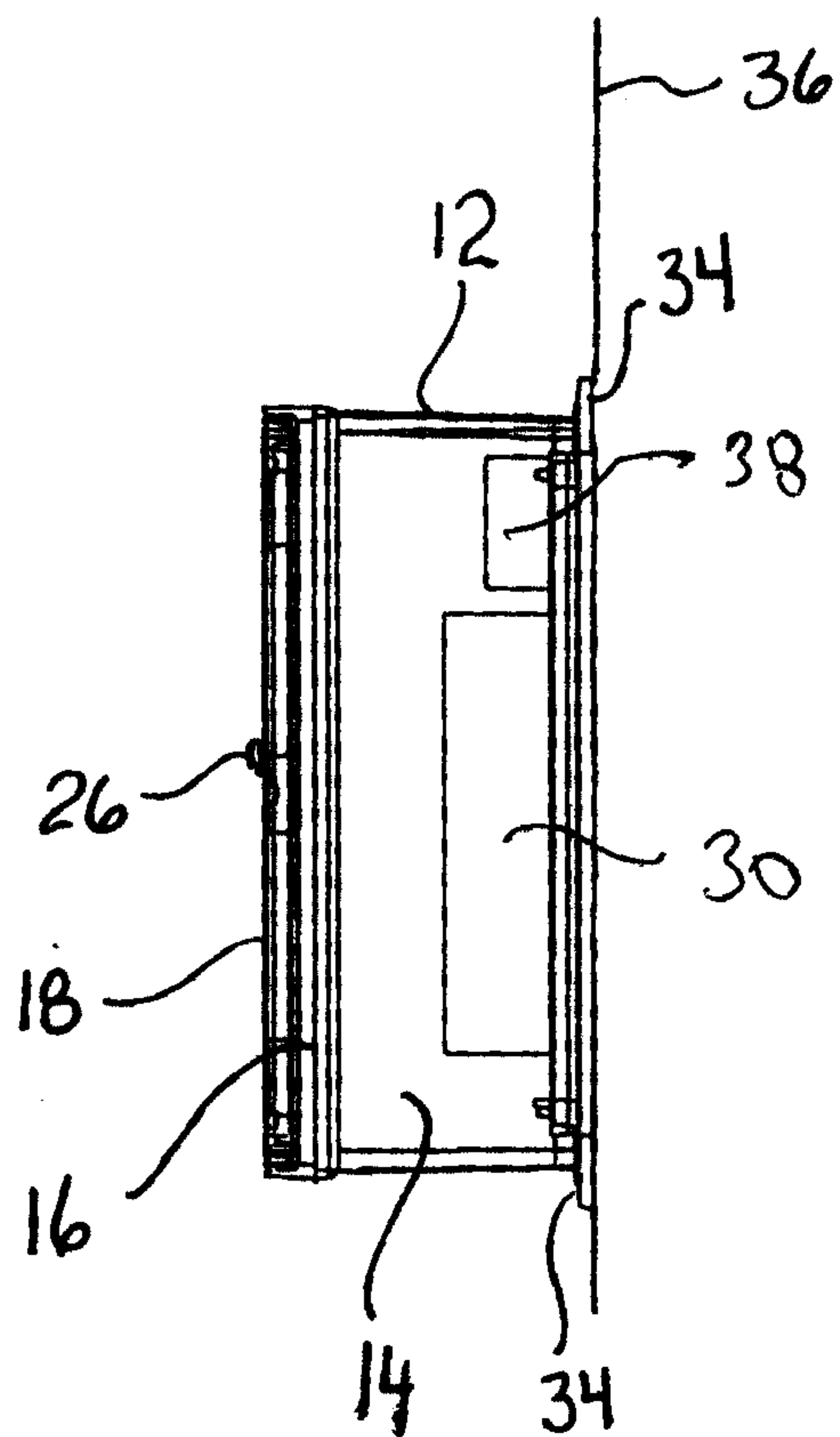


FIGURE 4

