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(71) Demandeur/Applicant:
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(54) Titre : ENCEINTE DE FENETRE AUTOMATISEE
(54) Title: AUTOMATED WINDOW ENCLOSURE

(57) Abrégé/Abstract:
This motorized, fully automated device remedies the obvious security and thermal deficiencies of glass windows in buildings generally. These R-25 insulated panels (minimum) are designed to close snuggly with their insulated frame -- which is thermally bonded to the building around the respective window in retrofits, and is built-in to new construction projects -- thus optimizing building thermal efficiency, while enhancing security impenetrability. Acting as an awning in the raised position, the panels shield direct sunlight into the window. Both models, for large windows (Fig.3) or for small windows (Fig. 10), close and open on demand by electric switch; or open manually by crank, in no-power mode; they are also fully automated, cycling according to pre-programming -- usually from dusk to dawn, or when building unoccupied. Specialty models will accommodate more intense requirements such as in the far north, hurricane zones, or inordinate crime-risk areas for example.

Patent application for PINEY, David D.

Abstract

Automated window enclosure.

This motorized, fully automated device remedies the obvious security and thermal deficiencies of glass windows in buildings generally. These R-25 insulated panels (minimum) are designed to close snuggly with their insulated frame -- which is thermally bonded to the building around the respective window in retrofits, and is built-in to new construction projects -- thus optimizing building thermal efficiency, while enhancing security impenetrability. Acting as an awning in the raised position, the panels shield direct sunlight into the window. Both models, for large windows (Fig.3) or for small windows (Fig.10), close and open on demand by electric switch; or open manually by crank, in no-power mode; they are also fully automated, cycling according to pre-programming -- usually from dusk to dawn, or when building unoccupied. Specialty models will accommodate more intense requirements such as in the far north, hurricane zones, or inordinate crime-risk areas for example.

Patent application for PINEY, David D.

Specifications.

Summary

Automated window enclosure.

This motorized, fully automated device remedies the obvious security and thermal deficiencies of glass windows in buildings generally, helping facilitate unprecedented thermal efficiencies -- approaching exterior wall R-factor standards of the region as a minimum. In combination with emerging LED technologies these window enclosure panels will help redefine the use of window daylight for general interior lighting purposes during harsh winter days, and thus contribute valuably to energy conservation efforts.

These window enclosure panels are designed to close snuggly with their insulated frame -- which is thermally bonded to the building around the respective window in retrofits, and is built-in to new construction projects -- thus helping optimize building thermal efficiency, while enhancing building impenetrability security.

Acting as an awning in the raised position, the panels also shield direct sunlight into the window. Both models, for large windows (Fig.3) or for small windows (Fig.10), have their control panels located on the interior wall directly beside the enclosed window. Thus the panels can conveniently open or close on demand by electric switch; or they can open by hand crank, in no-power mode; they are also fully automated, cycling according to pre-programming -- usually from dusk to dawn, or when building is to be unoccupied. Specialty models will accommodate more intense requirements such as in the far north, hurricane zones, or inordinate crime-risk areas for example.

Background art:

The background art in Canadian patents for dealing with the thermal and security frailties of window glass has largely overlooked the energy-loss element, which is only now being fully recognized and thus addressed. There is considerable innovation when it comes to security

protection through fortifying glass windows with external devices, but they have almost exclusively focused on the shutter type design -- though one US patent #4,370,826 did insulate the shutters. There is a Canadian patent, #550071, for a rigid awning that hinges downward to fully enclose the window (as proposed herein) when desired, but its focus is designed to protect the window glass from storm damage and doesn't fully address the security issue, nor does it address the window thermal-loss issue; as well, it is manually opened and closed, from outside the building. The only Canadian thermal window enclosure that I could find, patent # CA2069986, was applied by an adhesive backing to the window glass when required, and it didn't offer any security options. Therefore, to the best of my knowledge, I would classify the device proposed herein as largely a novel application of existing materials and mechanics to better address the thermal and security frailties of using window glass for building construction.

Description

Automated window enclosure.

Materials used in constructing this device will fluctuate according to the weather demands of the region (but basically the panel insulation will at least equal the exterior wall R-factor standards of the region.) Both models are security-conscious designed, and when closed present no building intrusion opportunities short of those involving building demolition tools, which would make wood framed walls of most buildings equally vulnerable. For customers with extreme security requirements we offer a custom, steel-plate clad model.

In the case of the large window models depicted in fig.3, two horizontally hinged panels rise by the lower panel's (Fig.2 –1) frame (fig. 2-3) corners, which are pivot anchored (Fig.2 joint #2) to specialty nuts (fig.4. Diag.#2-2), traveling on rotating threaded rods (fig.4.Diag#2-3) -- which are mounted vertically in the rigid exterior frame (fig4-1), and are geared together with the horizontal rod (fig.4-5) and coupling gears (fig.#4-4) so as to be driven by the motor / hand crank assembly (Fig.#4-3) primary threaded rod (fig.8-8) thus facilitating the hand-crank capability, which requires a single-drive mechanism. The upper panel (fig.2-2) is hinged with the top of the rigid external frame (fig.6-1) so the two panels fold outward from the window at

their center hinge as the bottom panel rises from its vertical to horizontal axis, which is the fully open position; and then because of specially designed hinge joints (fig.2 joint#1) the panel is able to rise further, thus both panels now folded tightly together are able to flop downward, to present adjustable angles to the sun typical with conventional awnings, as required.

The panels close the same way; the upper panel is hinged to allow its trailing edge to seat snugly with the molded plastic gasket (fig.5-3) of the rigid frame as it closes; the middle hinge, joining the two panels, pivots on the inside surface of the panel frame, allowing them to fold together in the "open" position (fig.2 joint#1), as well, the trailing ends of the square edged panels butt tightly as they close (one of which uses a soft rubber gasket to facilitate snug closure (Fig.2-4)). The lower panel is designed to seat tightly with the bottom gasket (fig.7 & fig.9) of the rigid exterior frame. There are specialty molded gasket-junction sections in the corners to converge the rigid exterior frame side gaskets to the rigid exterior frame top and bottom gaskets (fig9.Diag.#B), which also provide a bug, water barrier.

Mere inches before the panels fully close, the engagement arm (Fig.4.Diag.#2-4) -- part of the panel frame mount (fig.4.diag.#2-1) riding on the rotating threaded rod (fig.4.diag.#2-3) – contacts the folding mounting bracket (fig.4.diag.#2-5, which stands the threaded rod off the seating position) at its fulcrum, thus dragging it closed and forcing a tight seal between the panels and their correspondingly beveled gaskets. This engagement arm has a forked head (fig.4.diag.#3-1) with inner and outer spring-steel gripper flanges (fig.4.diag.#3-2) that grasp the fulcrum of the folding bracket as it is forced closed, thus aiding its return spring in dragging the folding bracket to its open position by the retreating panel frame mount as the motor or crank reverses direction in order to open the cover.

. The crank handle mechanism (fig.#8) conveniently protrudes from the interior wall-mounted control panel, directly beside the window that's enclosed, with either model. As the crank handle (fig.#8-2) is turned in the "open" direction the telescoping crank handle /shaft joint (slotted fit, fig.#8-6) allows the shaft to advance by its acme threads (fig.#8-5) pushing the

platform motor gear (fig.#8-7) out of the threaded rod gear circuit (fig.#8-9, via the electric motor floating-platform/ floating-guide interface of the fixed-bracket assembly listed in fig.8), and pushing the hand-crank gear (fig.#8-3) to mesh instead. The shaft has a machined idle position designed to float inside the advancement nut (fig.#8-10) as the acme threads exit it in the shaft-advanced position. Even though they ride directly against each other, the heavy acme thread face will suffer little wear against the advancement nut face in the fully advanced position as the crank handle is continually turned to open the panel(s), because this emergency (hand crank) procedure will not be commonly applied. When the panel(s) is/are raised to the "awning position" the crank handle is turned one rotation in the opposite direction -- to reset the system to the motorized position -- thus the floating platform return spring (fig.#8-4) re-engages the acme threads on the crank shaft with the advancement nut, retracting the crank shaft and the floating platform, thus re-engaging the motor gear.

The small window model (fig.1), with heights of only a few feet, is largely the same design as the dual panel model except that it uses a single panel construction and only one rotating threaded rod. Otherwise, the rigid exterior frame and molding is identical. The outside edge, of the top panel, is hinged to the top of the rigid exterior frame, as is the large window model, but the motor / crank assembly (Fig.1.diag.#A-1) turns the primary threaded rod, which in this model, engages the swivel-coupling nut (Fig.1.diag.#A-4), which directly raises the panel frame (Fig.1.diag.#A-2) lever arm (Fig.1.diag.#A-3) and thus the panel.
The single panel model has identical beveled sides, and corresponding beveled seats in the rigid exterior frame molded gasket (fig. 7-2, fig.5-3), as does the large window model.

The gasket seat take-up joint (fig.7-3, fig.5-1) permits using wear resistant, heavy weight, rigid plastic material (~50mm.) while allowing the gasket to easily compress over 1 inch in order to harmonize the mating contours and thus thermally seal the panel / gasket junction. The custom coupling /decoupling tool (fig.5) is required for installation and servicing this unit, in order to access the screw-in gasket reinforcement mount (fig.5-2, fig.7-1) for disassembly, for example.

The motor is designed rotate in the direction of the current polarity, and to shut off and reset when stalled (fig.11) as part of the panel seating mechanism (thus compensating for an unscheduled usage -- when panels are inadvertently left open -- in order to reset the window position according to the timer program.)

When either timer (fig.11-1&2) is activated they connect their respective polarity to the power solenoid for a few seconds, thus the solenoid energizes its contact switch plunger (fig.11-12) accordingly, either extending upward to complete the upper circuits (fig.11-7), or extending downward to complete the lower circuits, thus emulating the current output polarity with the timer input polarity and triggering the "open or close" rotational direction to the motor. As the solenoid plunger contacts with the main circuits it draws its power from there, but can be interrupted by the bimetallic thermal-switch solenoid wire circuit (fig.11-8).

The stall /reset feature is predicated on the bimetallic thermal-switch (fig.11-11), which is cooled by the fan cowling port (fig.11-6) as the armature is turning. When the panel(s) seats and the armature stalls, the fan (fig.11-5, which is part of the fan /cowling assembly, fig.11-13, mounted to the armature shaft, fig.11-14) stops, and thus the bimetallic thermal-switch in the power circuit heats and opens; thus (through wire fig.11-8) the solenoid discharges and the spring-loaded plunger reverts to the neutral position, breaking the power circuit connection, so that when the bimetallic thermal-switch cools and closes (ready for the next cycle) the power source will have been disconnected.

The automated function of the system is two simple timers (store-bought) offering multiple daily selections to automatically open or close the panel(s) (ie. dusk to dawn, while at work, on vacation, etc.). These timer circuits deliver respective polarity current (for a few seconds) to the power solenoid, whereby the plunger responds accordingly connecting the desired main circuits, thus facilitating the motor (fig.11-4) rotation direction, and the opening or closing of the panels.

The electric switch opens or closes the panel(s) according to operator whim, thereby offering awning positioning, or even the partial opening or closing of panels. The (slider type) electric switch (fig.12) is conveniently located on the inside wall control panel directly beside the enclosed window. When the spring-loaded switch cover (fig.12-2) is pushed off the neutral position in either direction (to open or to close panels) its electrical contacts join the positive in-terminal wiring to either out-terminal wiring configuration (fig.12-3), and similarly the negative in-terminal wiring to the opposite polarity out-terminal wiring configuration (fig.12-3), thus directly controlling current polarity to the motor and thereby its rotation direction. The electrical switch function is wholly operator controlled, and thus when the panel(s) seats the switch is released, thereby the spring-loaded mechanism returns it to the neutral position. The panel stall / reset mechanism is unnecessary in this (operator controlled) circuit, and is thus directly wired to the motor, bypassing the power solenoid.

Drawing description:

Figure 1.tif; front view, single panel model, diag.#A.tif reference.

Figure1.diag.#A.tif; front view, single panel model, frame-lever reference.

Figure2.tif; side view, dual panel model, specialty hinge reference.

Figure3.tif; front view, Dual panel model (for patent public-display.)

Figure4.tif; front view, rigid exterior frame (gaskets removed) reference.

Figure4.diag.#2.tif; side view, dual panel, mount /seating mechanism reference.

Figure4.diag.#3.tif; side /top view, engagement arm reference.

Figure5.tif; side view, rigid external frame gasket reference (sides and top).

Figure6.tif; front view, rigid external frame mounts reference.

Figure7.tif; side view, rigid exterior frame bottom gasket reference.

Figure8.tif; side view, hand crank / motor assembly reference.

Figure9.tif; front view, rigid exterior frame sides /bottom molded-gasket-junction reference.

Figure9.diag.#B.tif; front view, showing junction take-up joints.

Figure.10.tif; front view, single panel model (for patent public-display).

Figure11.tif; schematic, motor direction, stall/ reset circuit.

Figure12.tif; schematic, motor direction electric switch.

Claims.

The embodiment of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. This novel method of hinging these motorized insulated panels from above the window, awning style(fig.3.tif) (fig.10.tif), not only protects the window from direct sunlight, if desired, but importantly protects snow from accumulating within the exterior rigid frame,
2. and the purposeful low profile of the bottom gasket and rigid exterior frame bottom facilitate closing panels in pushing out remaining drifted snow residue, thus ensuring an unobstructed tight seal between the panel and the gaskets.
3. As well, the steeply beveled molded gasket seats are designed to run off water thoroughly, including melted snow remnants trapped within the closed panels, thus ensuring the especially sturdy (security conscious) motor / crank mechanism can easily overcome any freeze-up bonds that may occur due to unavoidable condensation, etc.
4. Further, this novel use of the motorized panels proposed herein, facilitate unprecedented thermal efficiency, approaching exterior wall R-factor standards of the region as a minimum, and in combination with new LED technologies will help redefine the use of window daylight for general interior lighting purposes during harsh winter days, and thus contribute valuably to energy conservation efforts.
5. These panels are designed to;
6. seat snugly with the insulated frame –
7. which is thermally bonded to the building surrounding the window in retrofits,
8. or is built-in for new construction projects –
9. the panels raise to an adjustable awning position
10. when opened by electric switch,
11. hand crank or

12. fully automated mode -- from dusk to dawn, or when the building, or particular rooms with enclosed windows, are expected to be unoccupied, or when window view or natural lighting are undesired, etc.)
13. in order to help maximize building thermal efficiency
14. and building impenetrability options;
15. The duel-panel model mechanical seating method prevents wear (on the panel bevel-face and its molded gasket seat) through abrasion -- as they glide past each other opening and closing -- by raising the panel completely off its seat after opening only a few inches.
16. This is achieved in this instance by opening the folding mounting bracket (fig.4.diag.#2.tif) that anchors the lower end of the rotating threaded rod bearing to the rigid exterior frame base (on one plane, with a pivoting upper bracket that anchors the threaded rod bearing to the rigid exterior frame wall, thus stabilizing the other plane; the other – upper -- end of the rotating threaded rod pivot-mounts the bearing to the frame) thus raising the rotating threaded rod (with its specialty nut, riding on the threaded rod carrying the panel frame mount) and therefore the panel: when closing, mere inches before the panels fully close, the engagement arm -- part of the panel frame mount, riding on the threaded rod -- contacts the folding mounting bracket (which stands the threaded rod off the seating position) at its fulcrum, thus dragging it closed and forcing a tight seal between the panels and their correspondingly beveled gaskets.
17. This engagement arm (fig.4.diag.#2.tif) has a forked-head guide (fig.4diag.#3.tif) with inner and outer spring-steel gripper flanges, that grasp the fulcrum of the folding bracket as it is forced closed, thus aiding its return spring in dragging the folding bracket to its open position by the retreating panel frame mount as the motor or crank reverses direction in order to open the cover.
18. In case of emergency, a no-power mode for opening the panel(s) is included (fig.8); as the crank handle is turned in the "open" direction the telescoping crank handle /shaft joint (slotted fit) allows the shaft to advance by its acme threads thereby pushing the platform motor gear out of the threaded rod gear circuit and pushing the hand-crank

gear to mesh instead; the hand crank shaft has a machined idle position designed to float inside the advancement nut as the acme threads exit it in the shaft-advanced position; even though they ride directly against each other, the heavy acme thread face will suffer little wear against the advancement nut face in the fully advanced position as the crank handle is continually turned to open the panel(s), because this emergency (hand crank) procedure will not be commonly applied; when the panels are raised to the "awning position" (or any height desired) the crank handle is turned one rotation (to its seat) in the opposite direction -- in order to reset the system in the motorized position -- thus the floating platform return spring re-engages the acme threads on the crank shaft with the advancement nut, retracting the crank shaft and the floating platform, thus re-engaging the motor gear.

19. The motor is designed rotate in the direction of current polarity, and to shut off and reset if stalled (fig.11.tif), as part of the panel seating mechanism (thus compensating for an unscheduled usage -- when panels are inadvertently left open -- in order to reset the window position according to the timer program); when either timer is activated they connect their respective polarity to the power solenoid for a few seconds, thus the solenoid energizes its contact switch plunger (fig.11-12) accordingly, extending upwards, to complete the upper circuits (fig.11-7), or extending downward, to complete the lower circuits thus emulating the current output polarity with the timer input polarity and triggering the "open or close" rotational direction to the motor. As the solenoid plunger contacts the main circuits it begins drawing its energizing power from there, which can be interrupted by the bimetallic thermal-switch solenoid wire circuit (fig.11-8).

20. The stall /reset feature is predicated on a heat sensitive, bimetallic thermal-switch, which is part of a fan /cowling assembly we intend to manufacture, which is mounted to store-bought drive motors; the bimetallic thermal-switch is cooled in the fan cowling port, which concentrates airflow from the armature fan onto the bimetallic thermal-switch as the armature turns in either direction; when the panel(s) seats, and the armature stalls, the airflow stops, and thus the bimetallic thermal-switch heats and opens; thereby (through wire fig.11-8) the solenoid discharges and the spring-loaded

plunger reverts to the neutral position, breaking the power circuit connection, so that when the bimetallic thermal-switch cools and closes (ready for the next cycle) the power source will have been disconnected.

21. The molded gaskets are an integral part of ensuring thermal efficiency, in combination with low-wear longevity, as well as providing a water and insect impenetrability barrier; the gasket take-up joints (fig.5.tif) are a novel method of using fairly heavy weight rigid plastic material (~50mm.) yet permitting the gasket to easily compress over 1 inch in order to harmonize the mating contours and snugly, thermally seal, the panel / gasket junction.

22. The custom coupling /decoupling tool (fig.5.tif) is required for installation and servicing the molded gaskets.

23. The gasket soft foam filling is hot-wire cut, slightly larger than the molded gasket it fills, thus ensuring a tight fit with no air gaps, and an intrinsic outward tension to expand the gasket take-up joint to its perimeter, thus ensuring its optimum compression capability for gasket / panel junction-contouring as needed, and therefore an airtight, thermal fit.

CA 02705085 2009-08-17

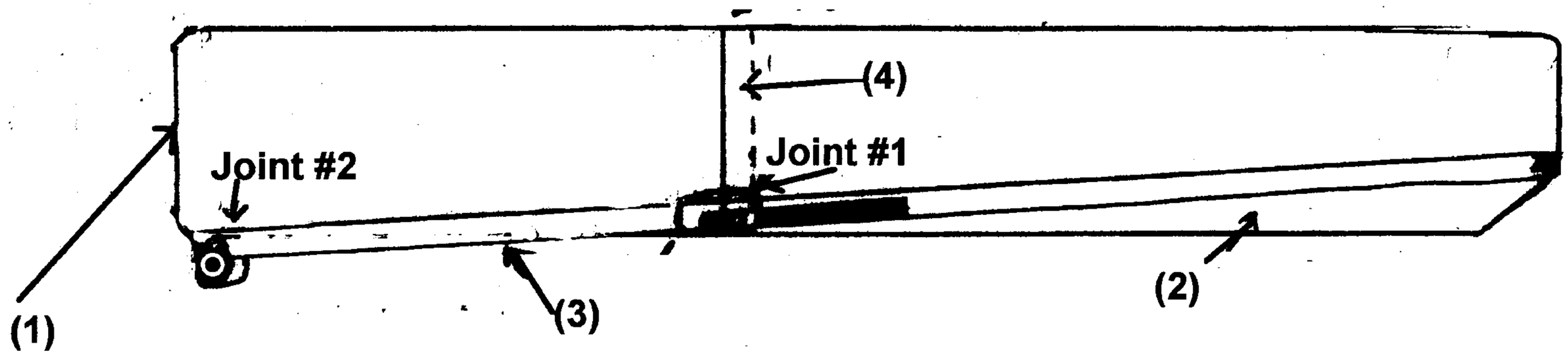
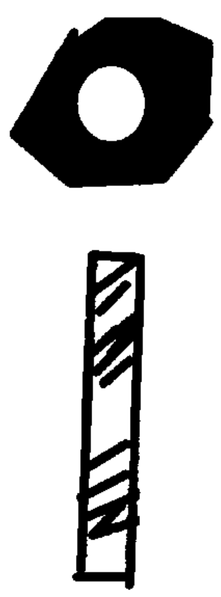


Fig. 2

Joint #2



Joint #1

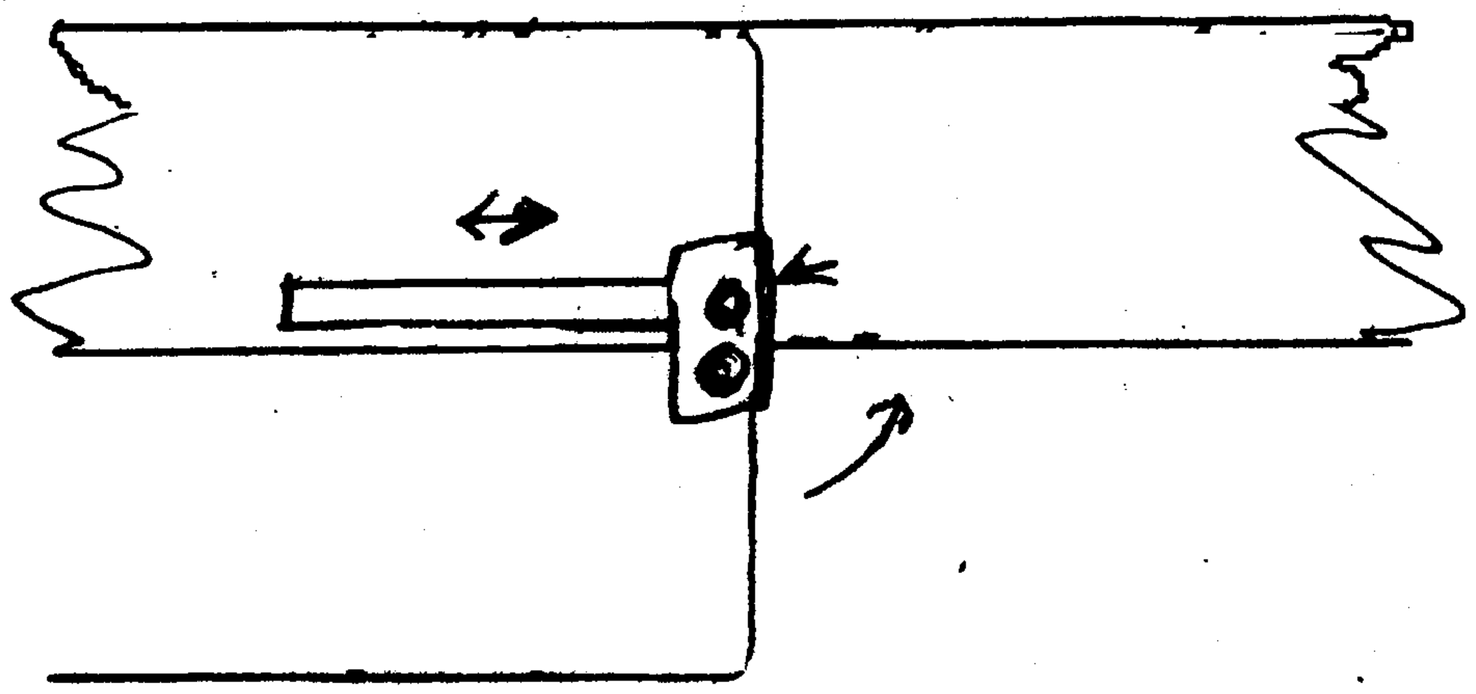


Figure 4.diag.#3

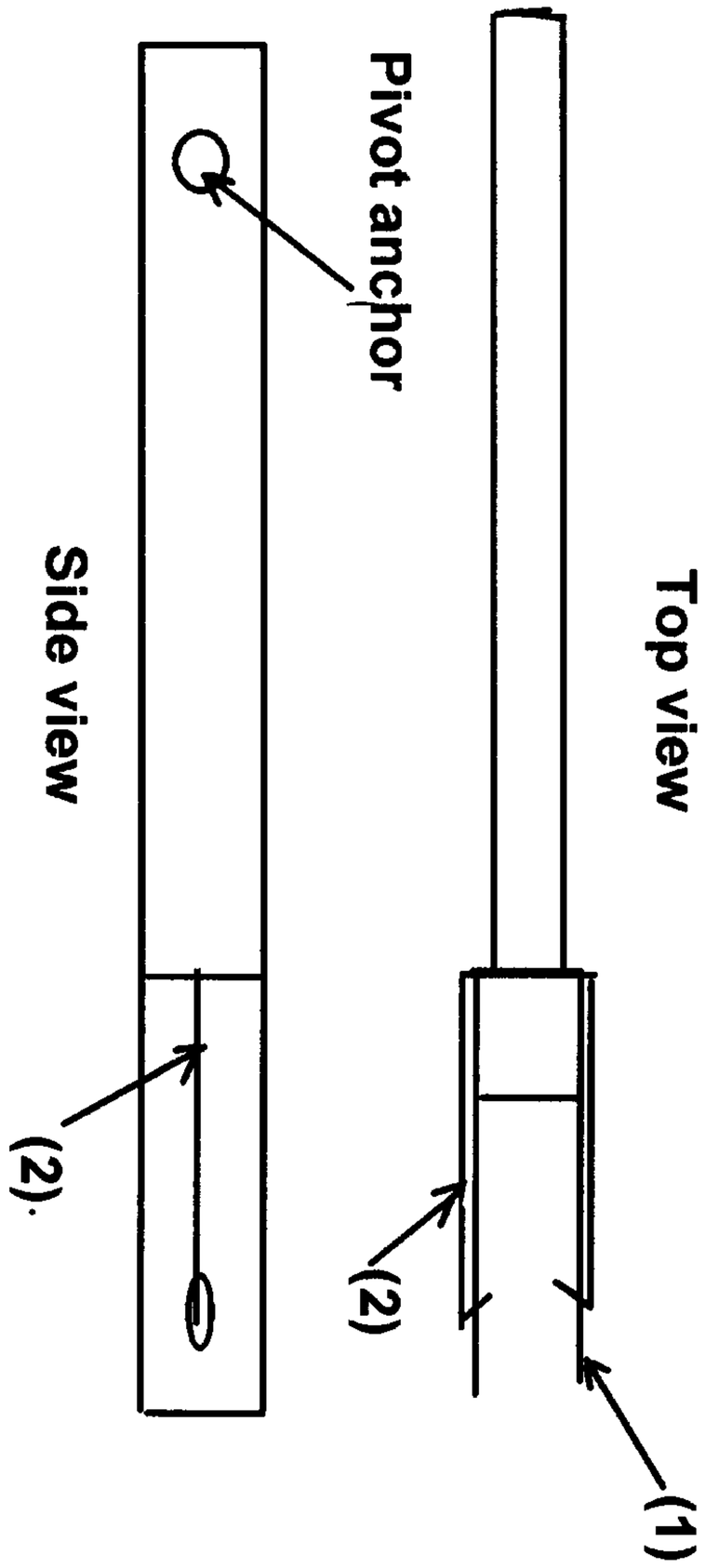


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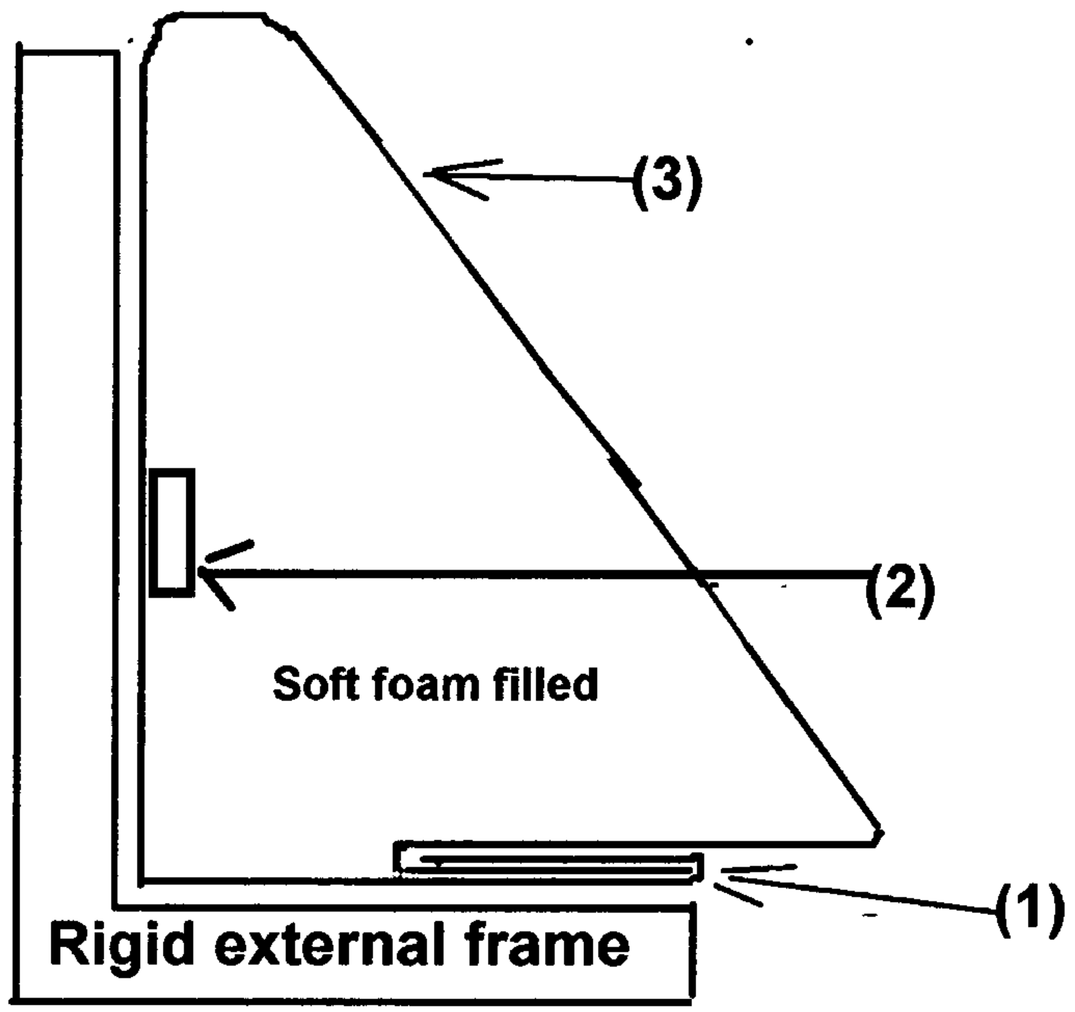
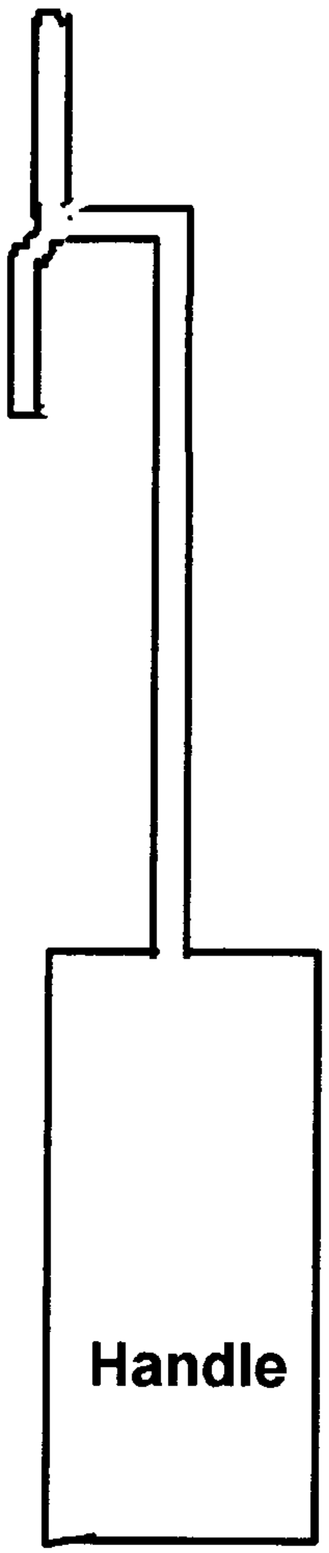
Figure 5.

Gasket seat, sides & top -- side view



Gasket coupling / decoupling tool.



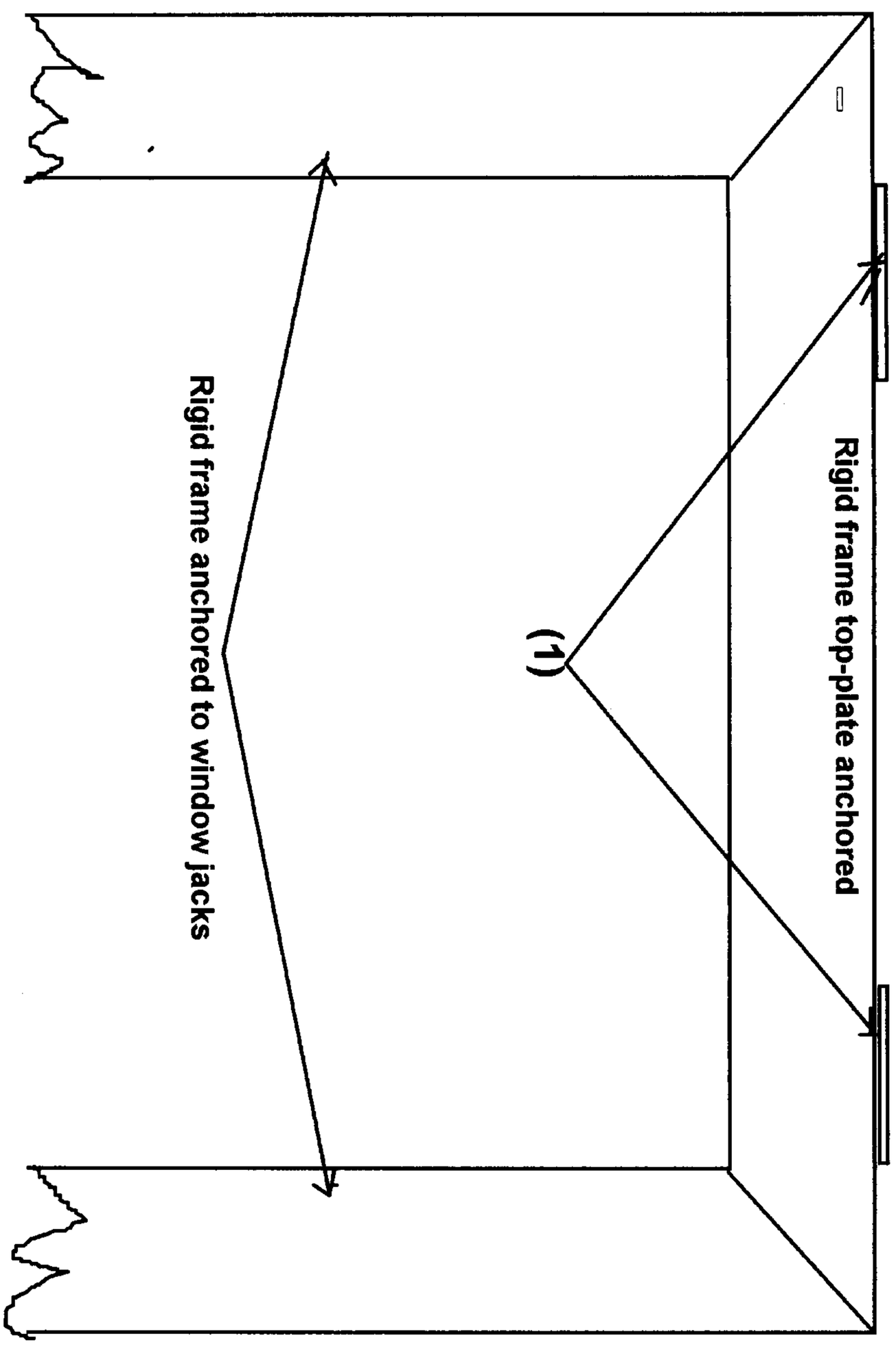
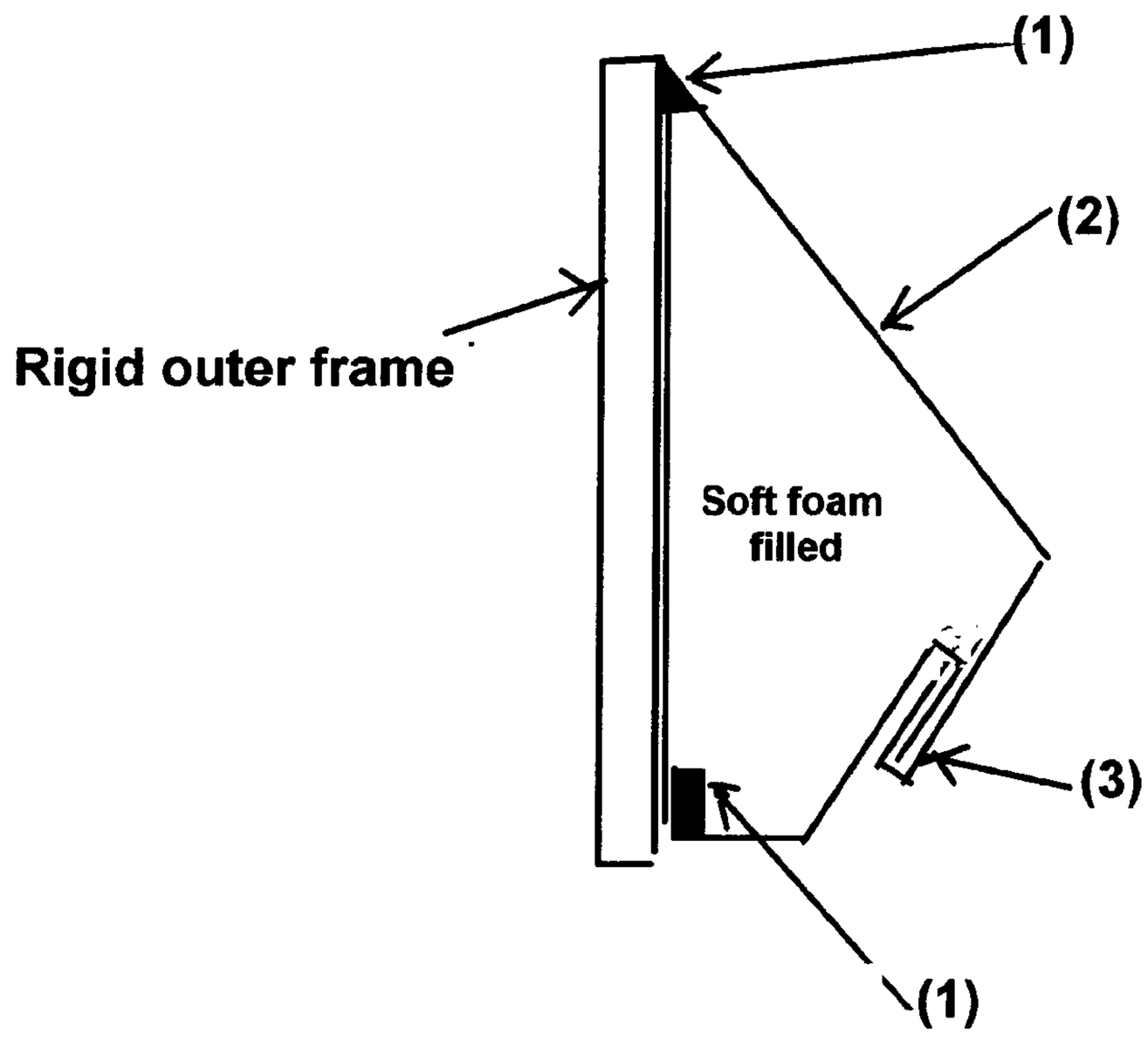


Figure 6. -- front view

Figure 7.

Gasket seat, bottom -- side view



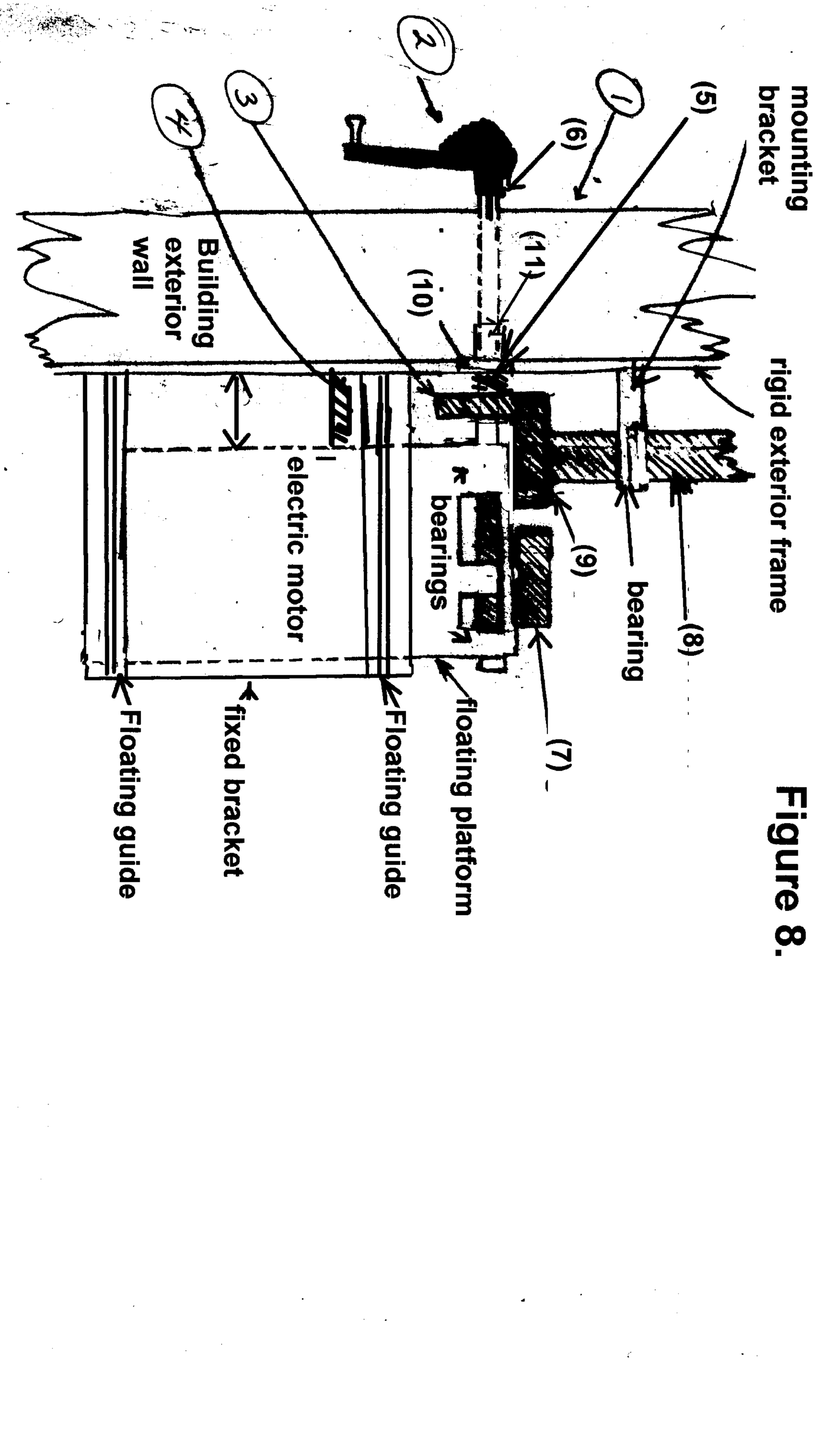

mounting bracket
rigid exterior frame
bearing
(8)
(9)
(7)
floating platform
Floating guide
fixed bracket
Floating guide
electric motor
bearings
Building exterior wall
(11)
(10)
(6)
(5)
1
2
3
4

Figure 8.

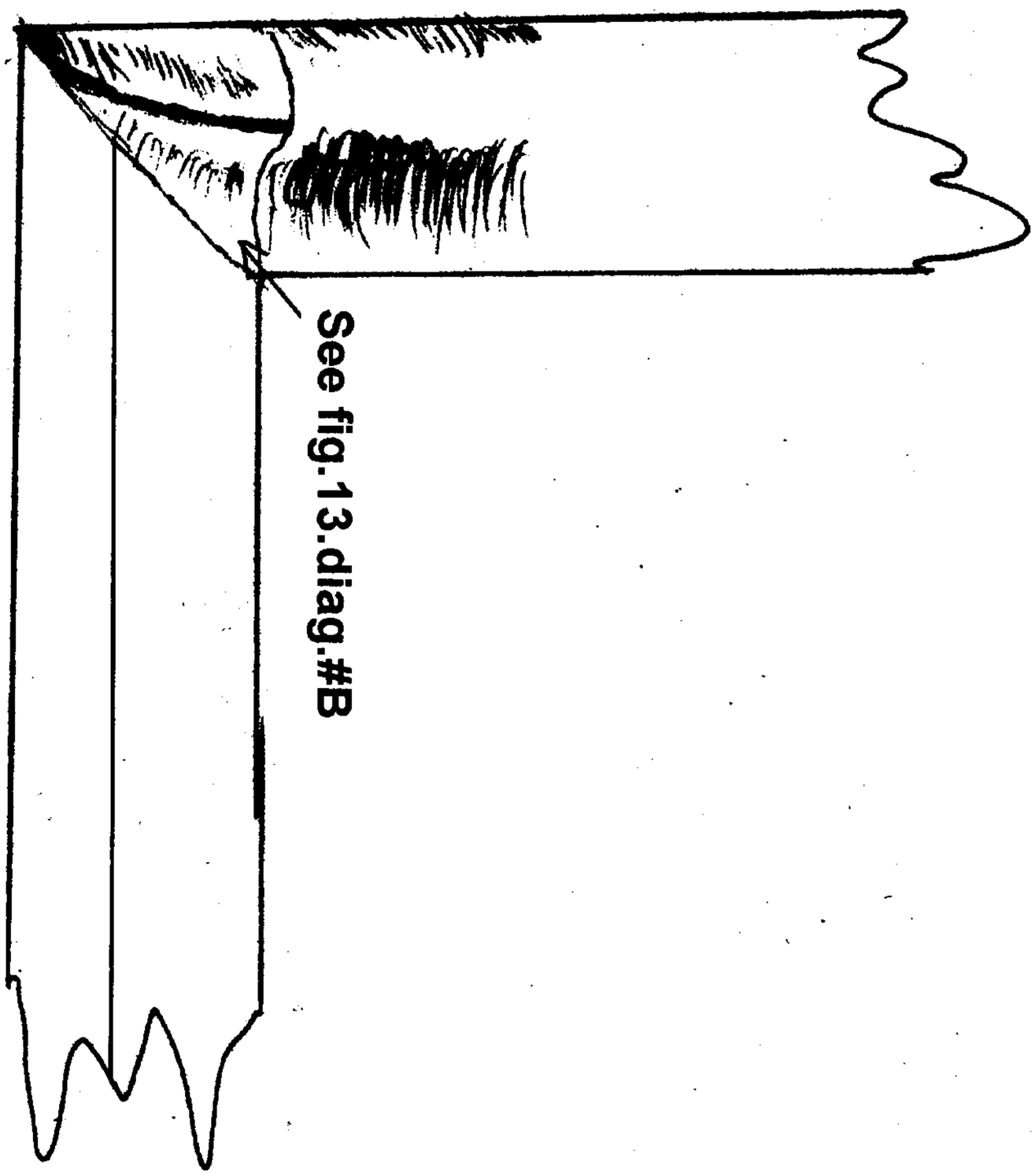


Figure 9.

Molded gasket, sides and bottom -- front view

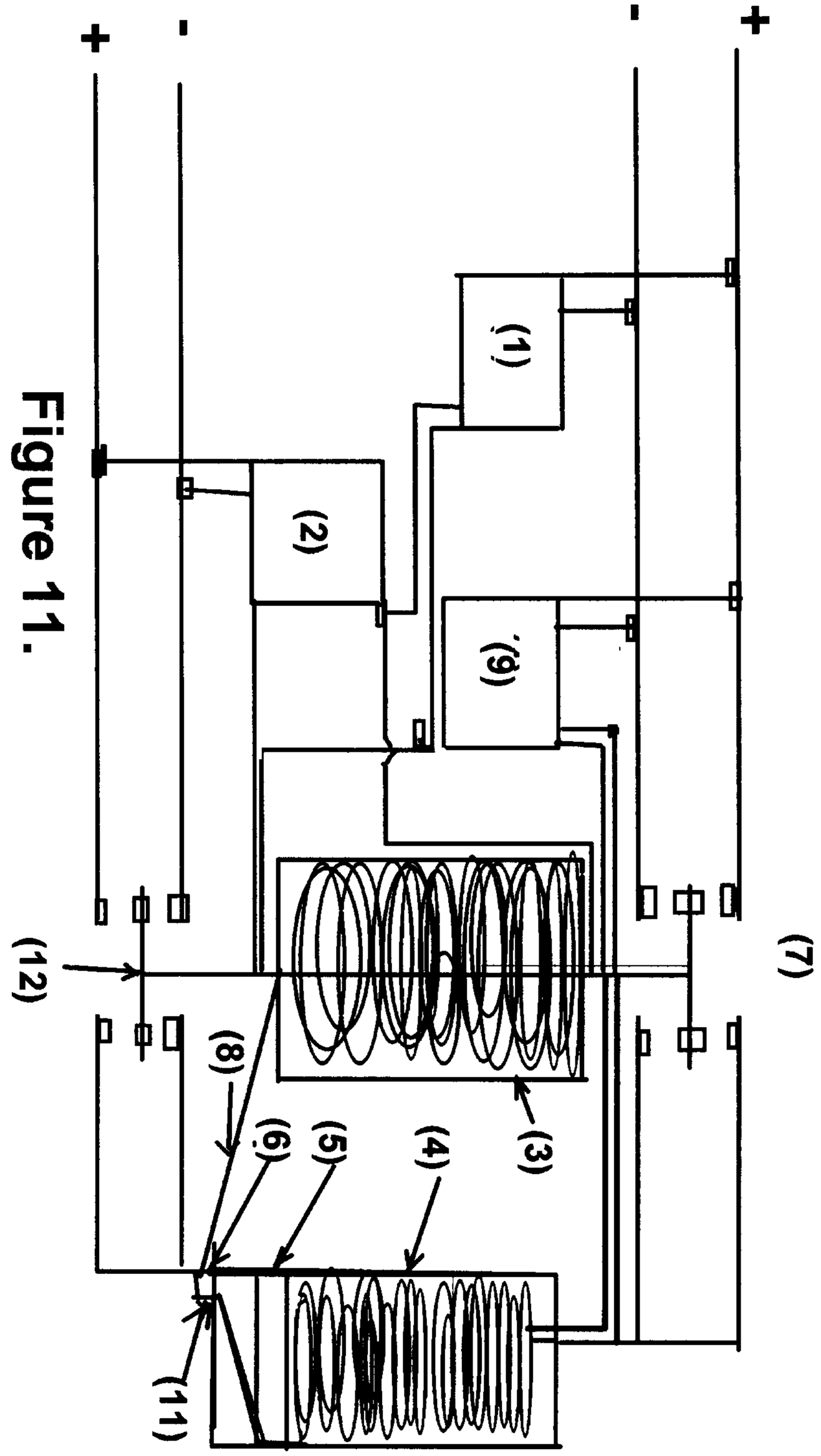


Figure 11.

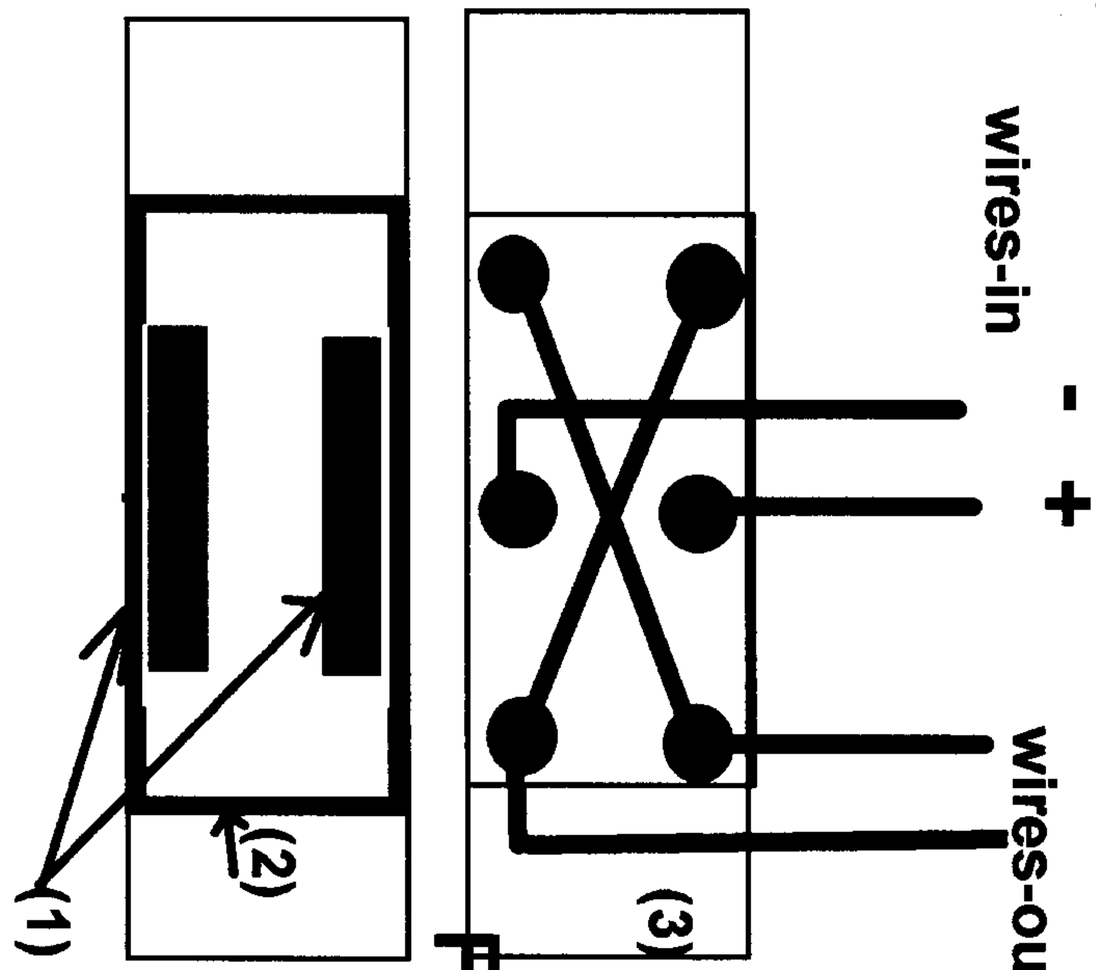
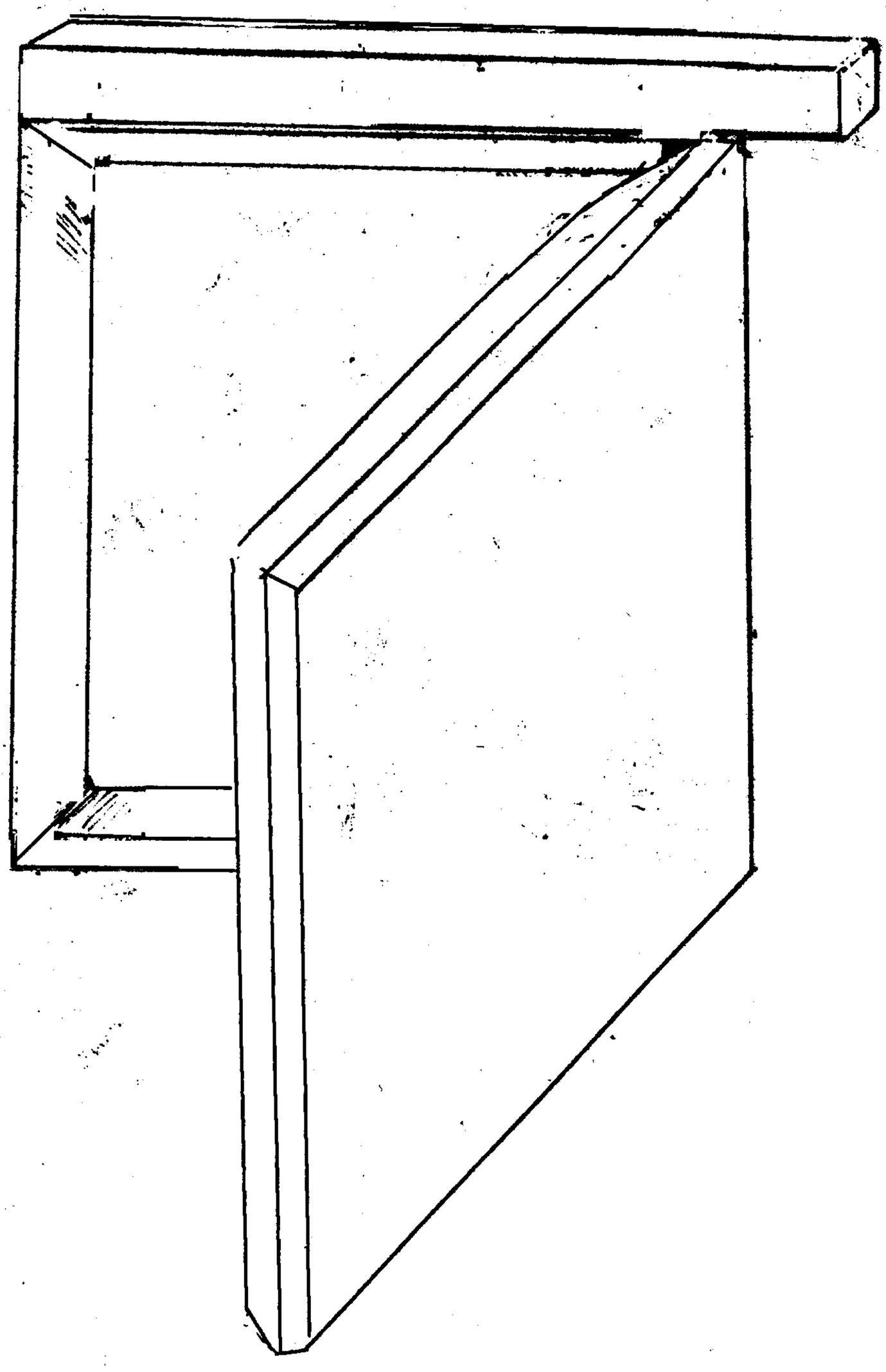
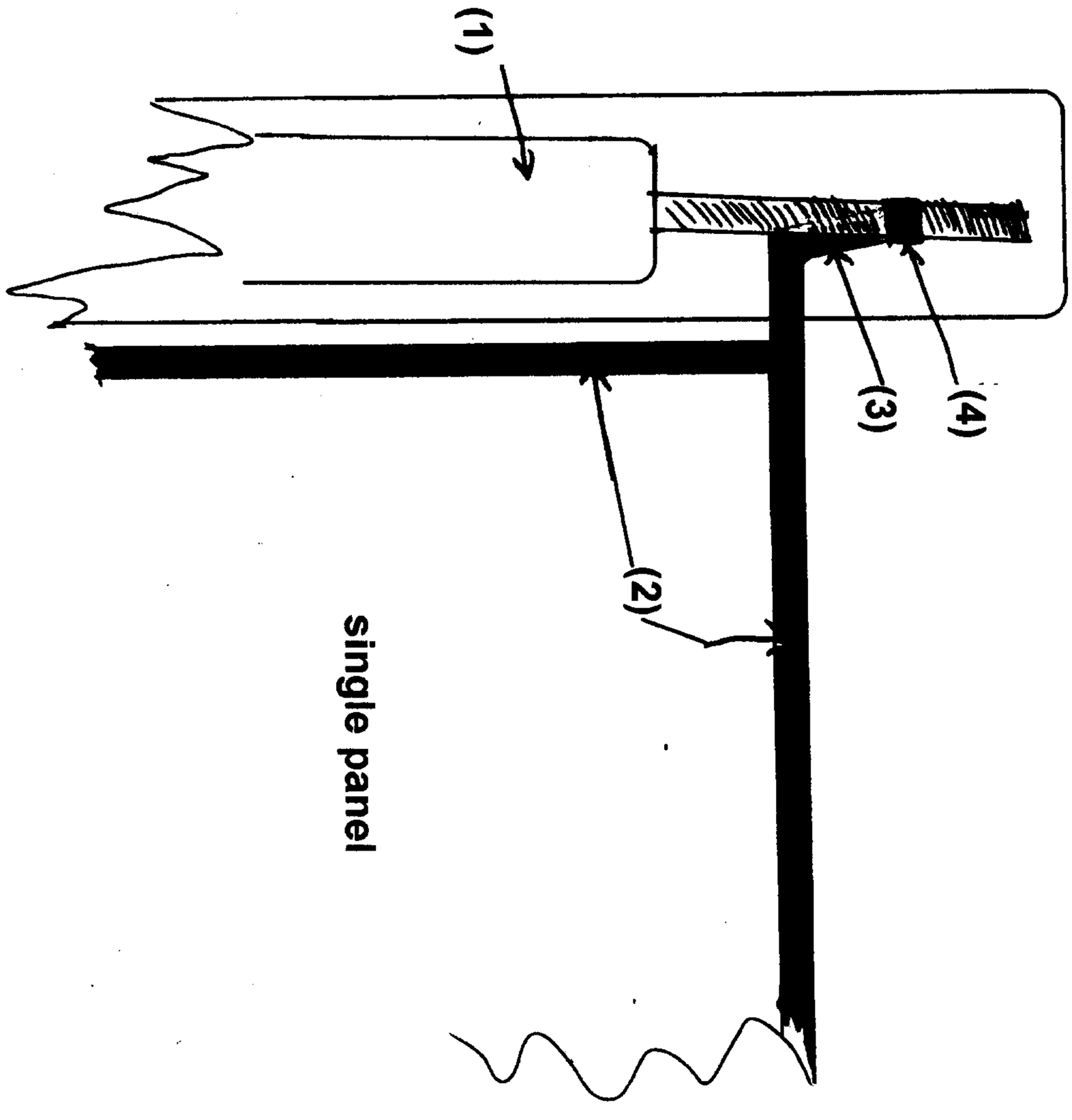


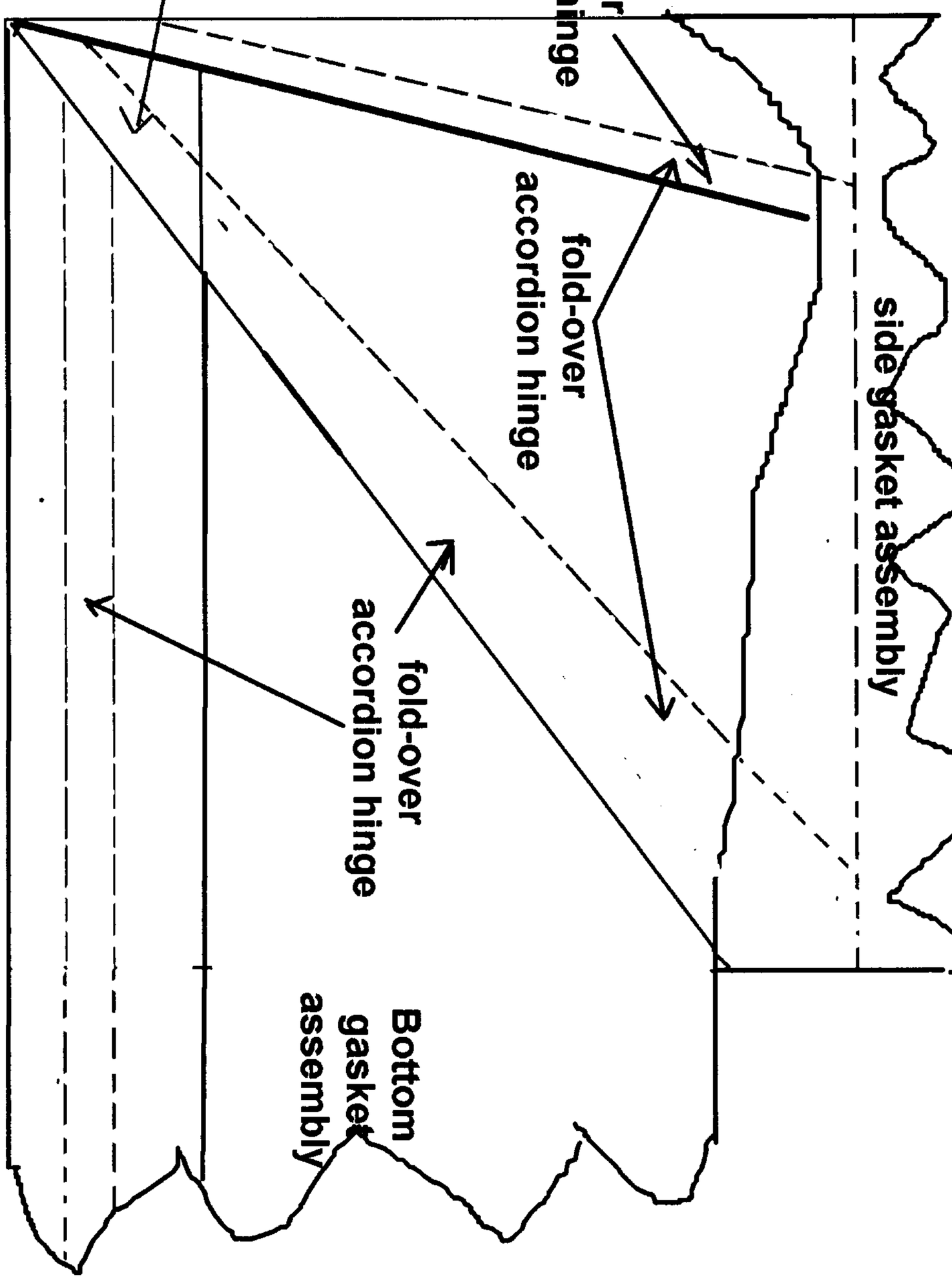
Figure 12

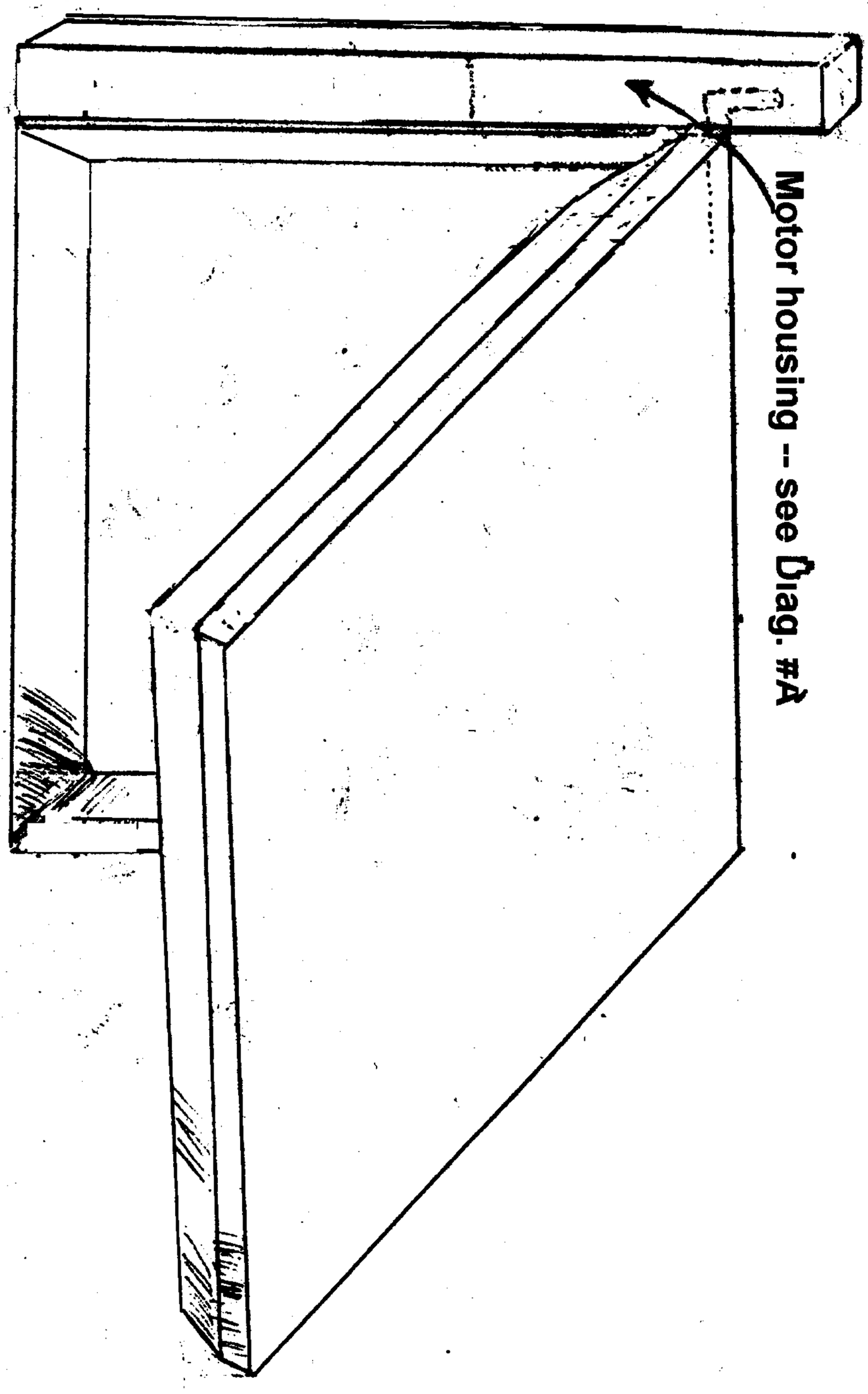


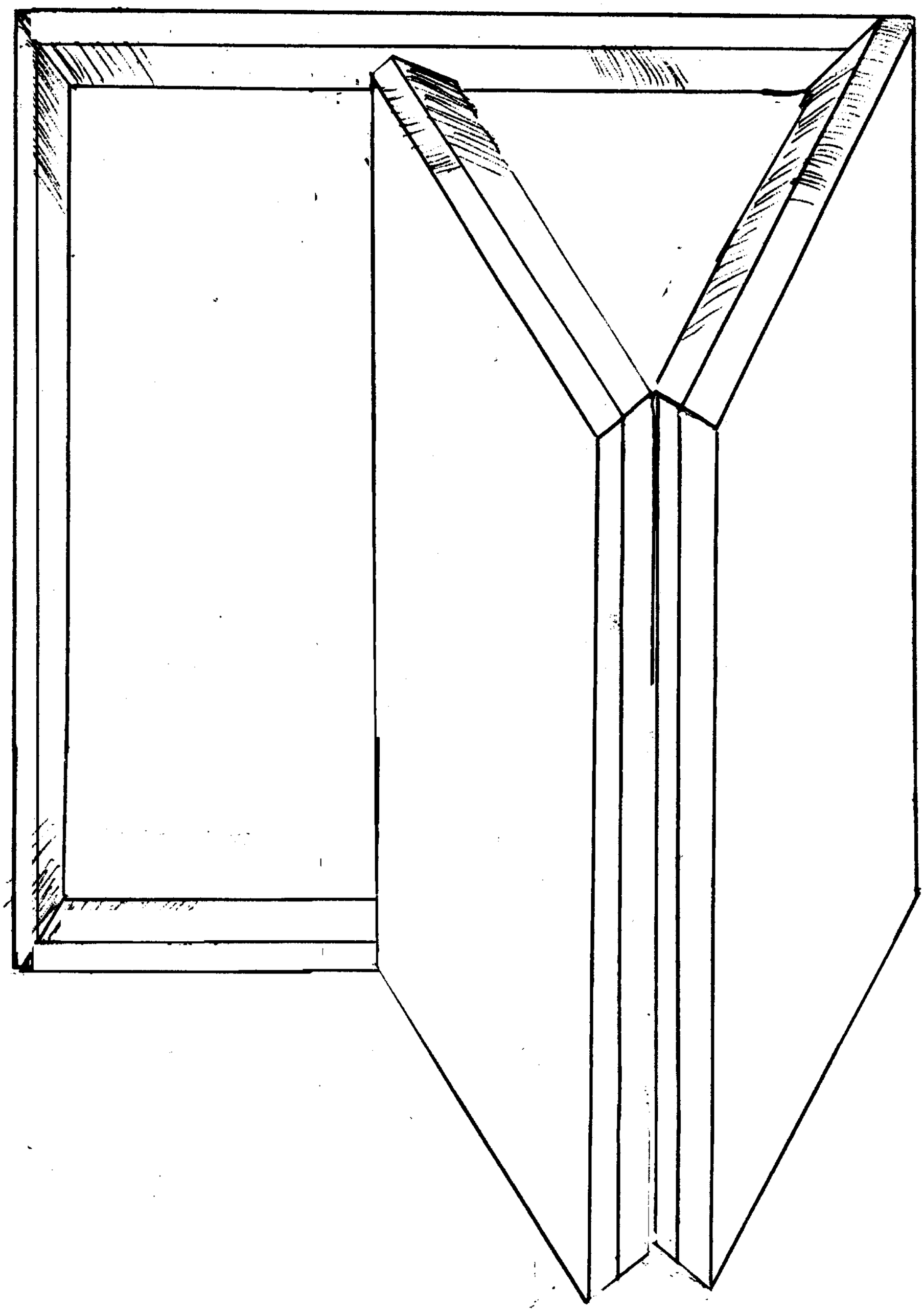


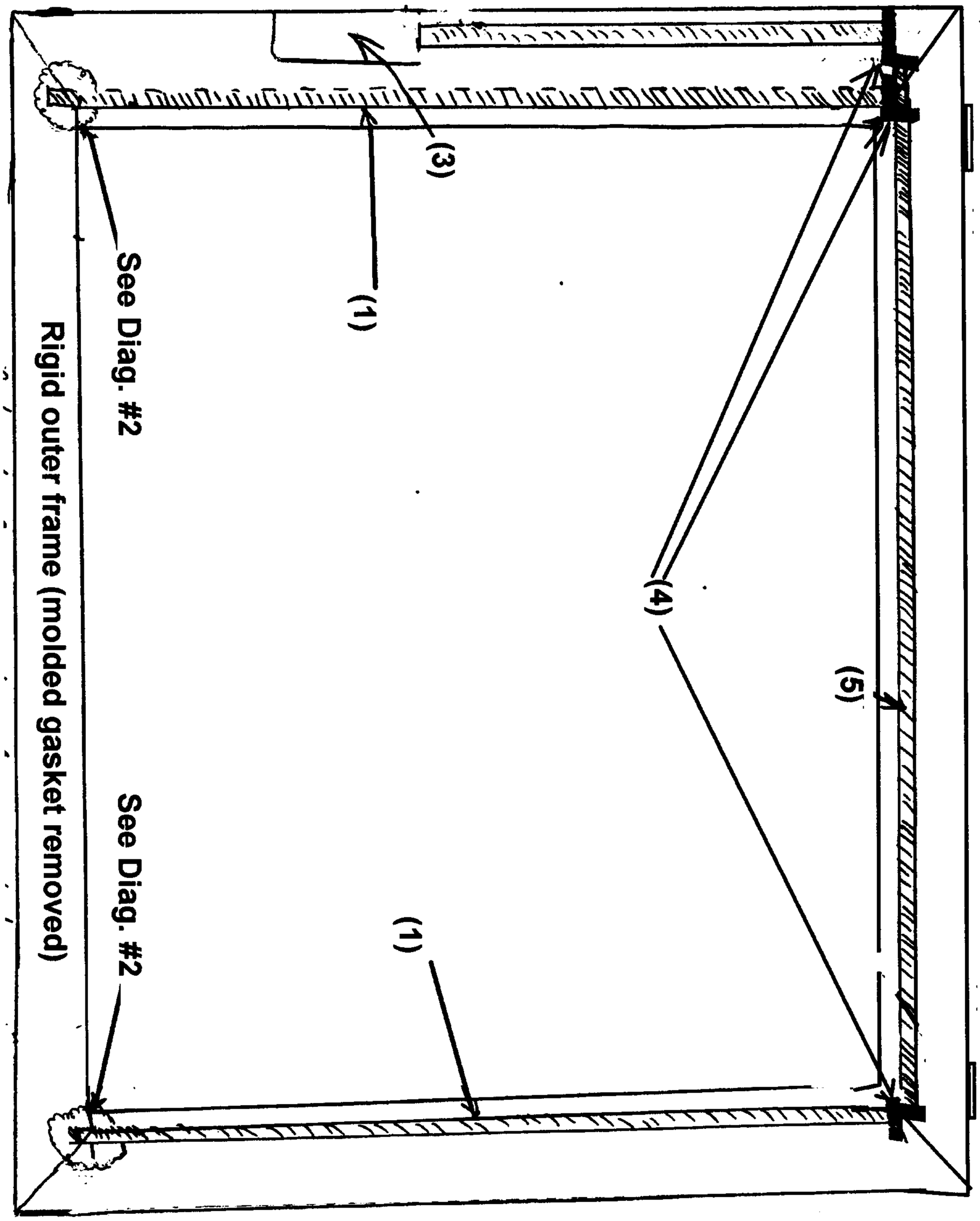
single panel

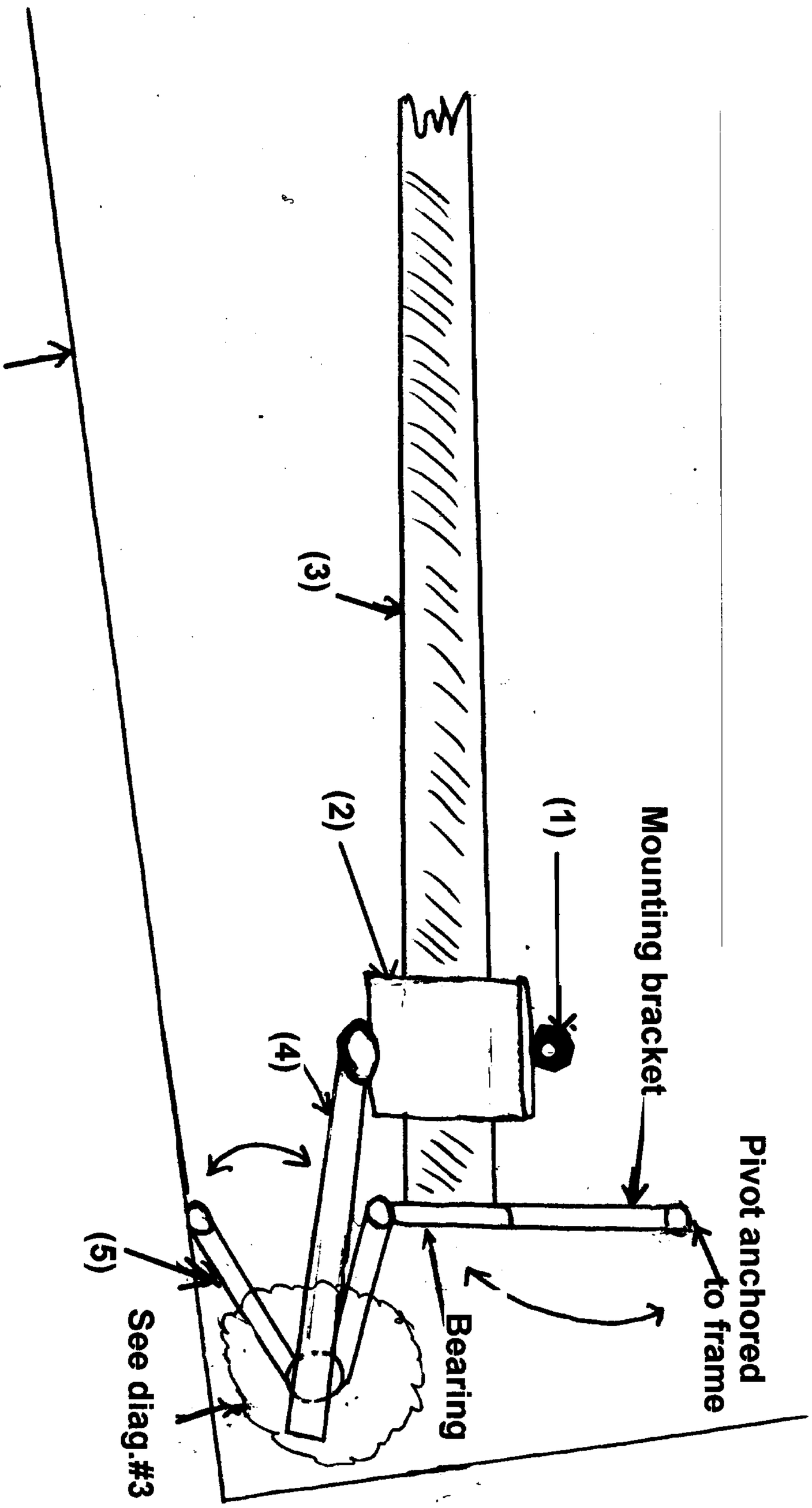
Side/ Bottom gasket junction piece (Daig.#B)




Motor housing -- see Diag. #A




(3)
(1)
See Diag. #2
(4)
(5)
Rigid outer frame (molded gasket removed)
See Diag. #2
(1)


Rigid outer frame
(3)
(2)
(1)
Mounting bracket
Pivot anchored to frame
(4)
Bearing
(5)
See diag.#3