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(54) Louverable shutter

(57) An adjustable shutter comprising a plurality of parallel slats, each slat being pivotable around a pivot axis parallel to a longitudinal direction of the slat. Each slat has an associated tilting mechanism at least at one end of the slat. The tilting mechanism is engageable with a corresponding tilting actuator that is displaceable in an axial direction normal to the pivot axis. The slats are linked to one another at adjoining edges of neighboring tilting mechanisms. Displacing the tilting actuator entails tilting of the slats about the pivot axis between open and closed positions, and whereby the slats are displaceable in the axial direction.

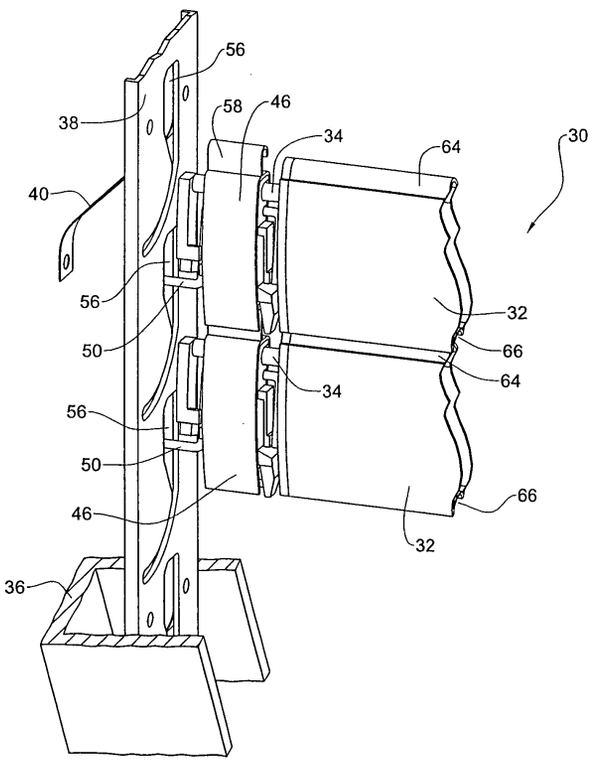

FIG. 1A

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Description

FIELD OF THE INVENTION

[0001] The present invention is concerned with an adjustable shutter of the type comprising a plurality of parallel slats pivotable about their longitudinal axis. Such shutters are often referred to in the art as *"jellowsy-type louvers ", "louverable shutters "*, etc.

[0002] The invention is further concerned with a tilting mechanism and a locking mechanism for such shutters.

BACKGROUND OF THE INVENTION

[0003] A louverable shutter comprises a plurality of parallely extending slats pivotable about their longitudinal axis. Such slats are fitted over openings such as windows and doors and occasionally are fitted also in sun roofs and are adapted for controlling the amount of light depending on the location of the sun.

[0004] Tilting the slats is facilitated by a suitable tilting mechanism typically comprising a common tilting member, e.g. a chain/cord, a rod, a belt etc. connected to all the slats, at their respective ends, whereby manipulating the tilting member entails corresponding tilting of the slats.

[0005] It is often required to roll the shutters about an axis parallel to the slats, for providing access through the opening, e.g. in case of a door, for increasing/decreasing the amount of light (or air flow) or to allow direct sunlight etc. However, many prior art rolling louverable shutters have the drawback of not being capable of being tilted when the shutters are at the so-called lowermost position, i.e. unrolled, or at a mid-position.

[0006] Even more so, another concern with prior art such shutters is that jamming of one of the shutters may entail consequent jamming of the adjoining shutters and prevent their tilting, owing to the fact that all shutters are fixedly engaged by a common tilting member.

[0007] It is often desired to provide a shutter of the concerned type with a locking mechanism to prevent unauthorized opening of the shutters, e.g. by attempting to tilt the shutters obviating the use of the tilting mechanism.

[0008] Amongst the following is a partial list of prior art concerned with shutters in the field of the present invention: U.S. 3,842,891, U.S. 4,519,434, U.S. 4,715,421, U.S. 5,188,161, U.S. 5,070,925, U.S. 5,188,161, U.S. 5,469,905, U.S. 5,575,322, U.S. 5,566,738, U.S. 5,575,322 and IL 109652.

[0009] It is an object of the present invention to provide an improved and novel louverable shutter in which the slats may be louvered also when the shutter is rolled or partially rolled. It is a further object of the present invention to provide a novel and improved tilting mechanism for facilitating the above features. In accordance with an aspect of the invention, there is also provided a locking mechanism to prevent picking of the shutters, except by using the tilting mechanism, so as to prevent unauthorized tilting of the shutters.

SUMMARY OF THE INVENTION

[0010] The present invention calls, by its primary object, for a louverable shutter assembly comprising a plurality of tiltable (louverable) slats parallelly extending and supported at their respective ends, wherein at least one end thereof is fitted with a tilting mechanism to facilitate tilting of the slats. By one particular embodiment of the invention, the shutter is a rollable shutter whereby tilting the slats is possible also at a partially rolled (partially opened) position of the shutter.

[0011] In accordance with the present invention there is provided an adjustable shutter comprising a plurality of slats extending at adjoining relationship, each slat comprising a pivot axis parallel to a longitudinal direction thereof; each slat associated with a tilting mechanism at least at one end thereof, said tilting mechanism engageable with a corresponding tilting actuator displaceable in an axial direction normal to the pivot axis; the slats being linked to one another at adjoining edges of neighboring tilting mechanisms; each tilting mechanism comprises a guiding member and a tilting member whereby displacing the tilting actuator entails tilting of the slats about said pivot axis between open and closed positions, and whereby the slats are displaceable in the axial direction.

[0012] In accordance with the present invention, the tilting actuator is a cam-type member and the tilting member is a follower-type member. In accordance with a particular embodiment of the invention the tilting actuator is a strap of rigid material formed with plurality of openings each defining a cam path engageable with a corresponding tilting member, the tilting actuator being displaceable in the axial direction so as to effect tilting of the slats, and in a direction parallel to the pivot axis so as to effect respective engagement and disengagement thereof with the respective tilting members of the slats.

[0013] In accordance with one particular embodiment of the invention, the tilting mechanism comprises a pivot axle fixedly attached to a respective slat and pivotally extending through an associated guiding member, and a laterally extending tilting member engageable with the tilting actuator and coupled with a lever arm fixed onto said pivot axle, for pivotal displacement therewith.

[0014] By another aspect of the invention there is provided a shutter locking mechanism to prevent unauthorized tilting of the shutters. Accordingly, tilting of the slats may be facilitated only by using the tilting mechanism whereby tilting is prevented by attempting to manipulate the slats.

[0015] In accordance with a particular embodiment the lever arm comprises a biasing portion for displacing the tilting member towards a locking latch fixed to the guiding member, whereby when a slat is in the closed

position and an attempt is made to tilt the slat, the biasing portion displaces the tilting member into arresting engagement with the locking latch, thus preventing tilting of the slat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] For better understanding of the invention and to see how it may be carried out in practice, reference will now be made, by way of example only, to the accompanying drawings, in which

Fig. 1A is an isometric view illustrating a portion of a vertical shutter with a tilting/locking mechanism, in accordance with the present invention, in a so-called closed position;
Fig. 1B is an isometric view of only a portion of the shutters of Fig. 1A;
Fig. 2A is an exploded isometric view of an end portion of a slat used in a shutter in accordance with the present invention, and a tilting and locking mechanism according to the invention;
Fig. 2B is a rear isometric view corresponding with Fig. 2A;
Fig. 3A is a partially sectioned front elevation of a portion of a shutter in accordance with the present invention, the shutter in a closed position, and the tilting mechanism disengaged from the tilting actuator;
Fig. 3B is a front elevation, partially sectioned, illustrating the tilting actuator in a position prior to engagement with the tilting mechanisms of the slats;
Fig. 3C is a front elevation corresponding with the position illustrated in Fig. 1A, with the tilting actuator engaged with the tilting mechanisms of the slats;
Fig. 3D is a front elevation of the shutter in an open position;
Fig. 3E is an isometric view of a shutter in an open position;
Figs 4A-4C are partly sectioned top elevations corresponding with the positions of Figs. 3A-3D, respectively;
Figs. 5A-5C are isometric views corresponding with the positions of Figs. 4A-4C, respectively;
Figs. 6 and **7** are sections through a tilting and locking assembly in accordance with the present invention, illustrating the locking assembly in various states, as follows:
Fig. 6A illustrates the locking assembly in a closed position, at rest;
Fig. 6B illustrates the locking mechanism upon attempt to force a slat open, thereby shifting the locking mechanism to a locked position;
Figs. 7A-7C illustrate consecutive steps of unlocking of the locking mechanism upon tilting of a slat using the tilting mechanism in accordance with the present invention;
Figs. 8A and **8B** illustrate a first embodiment of a tilting member in its respective locked and unlocked position;
Figs. 9A and **9B** illustrate a second embodiment of a tilting mechanism in its respective locked and unlocked position; and
Figs. 10A-10H illustrate different embodiments for biasing a tilting member into a locked position.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0017] Fig 1 illustrates a portion of an adjustable shutter in accordance with the present invention generally designated **30**. The shutter may be a vertical shutter i. e. of the type fitted at openings such as windows and doors, or it may be horizontal or inclined e.g. of the type installed in sun/light windows, etc. The shutter is illustrated with its slats **32** at their so-called closed position, i.e. coplanar arranged in a manner in which their adjoining longitudinal edges overlap, as known *per se.* Slats 32 are pivotable about its pivot axis **34,** which in the present example is horizontal.

[0018] The shutter **30** is a slidable shutter which is rollable so as to allow complete access through the opening at which it is fitted, wherein side edges of the slats **32** are slidingly received within a concealing support rail **36** fixed within the opening. The support rail **36** also supports a tilting actuator **38** by means of flexible steel straps **40** and it also prevents tempering/picking of the tilting mechanism. Each slat **32** is fitted at its respective end with a guiding member **46** accommodating a tilting member **50** laterally projecting and serving also as part of the locking mechanism, partially received within the guiding member **46**, as will become apparent hereinafter.

[0019] Tilting actuator **38** is in the form of a rigid strap of material (metal, plastic, etc) vertically extending and attached to the support rail 36 by flexible strips **40**, thereby rendering the support rail to be displaceable both in its axial direction (vertical in the present case) and in a direction parallel to the pivot axis **34** of the slats **32**. Strips **40** are typically made of steel straps though other arrangements are possible too, for supporting the actuator **38** in a displaceable manner, as mentioned above. The combined displacement of the tilting actuator **38** is obtained, for example, by an electric motor fitted with a suitable cam (schematically illustrated in Figs. 5A-5C) or by means of a manual actuator or lever (not shown).

[0020] The tilting actuator **38** is formed with a plurality of shaped apertures **56** which in fact serve as a cam engageable by tilting members **50** which correspondingly serve as followers. The shape and dimensions of apertures **56** dictate the tilting regime of the slats between an open position and a closed position, as will become apparent hereinafter.

[0021] Each guiding link **46** is formed with an upper hook **58** pivotally engaged within a corresponding lower hook **60** of an adjoining guiding member **46** as can best

be seen in Fig. 1B. It is further noticed that in the closed position the slats interlock with one another wherein an upper edge **64** of one slat is received in an overlapping manner within a corresponding receptacle **66** at a bottom edge of an adjacent slat.

[0022] Further attention is now directed to Figs. 2A and 2B illustrating a particular embodiment of a tilting and locking mechanism in accordance with the present invention. Guiding member **46** accommodates pivot axle **34** fitted at one end with a stump **72** adapted for snugly fitting within aperture **74** of slat **32**. At an opposed end of the pivot axle **34** there is formed a lever arm **78** formed adjacent a free end thereof **80** with a latch **84** for engaging with tilting member **50** and a slanted biasing portion **88** for clamping the tilting member **50** as will become apparent hereinafter.

[0023] Tilting member **50** is pivotally retained within guiding member 46 by block member **90** formed with a corresponding recess **92** receiving an axial portion **96** of the tilting member **50** and being essentially parallel with the free portion **50** engagable with the tilting actuator **38** as seen in Fig. 1A. An intermediate portion **98** extends between the axle portion **96** and the tilting portion **50**. Parallel to intermediate portion **98** there is a biasing arm portion **102** which at the assembled position bears against a biasing elastic portion **106**, integral with block member **90**, so as to bias the intermediate portion **98** into engagement with a locking latch **110** formed at an opposite side thereof. Pivot axle **34** is received within a corresponding recess **93** formed in block **90**, parallel to recess **92**.

[0024] The locking mechanism fitted in the shutter illustrated in connection with the present embodiment may be omitted without interfering with the tilting function of the tilting mechanism. The purpose of the locking mechanism is to prevent tilting of the shutters by tampering with the shutters. Figs. **3** to **5** are directed to illustrating how slats fitted within a shutter in accordance with the present invention are tilted between closed and open positions whilst reference to the locking mechanism will be made in connection with the other Figures.

[0025] With further reference also to Fig. **3A**, the shutter is illustrated in a closed position wherein the lateral engaging portion **51** of tilting member **50** extends not opposite an aperture **56** of the tilting actuator **38**. This position does not enable engagement of the engaging portion **51** of follower-type tilting members **50** within the cam-type apertures **56** whereby, engagement is facilitated only upon displacement of the slats and their associated tilting mechanism vertically, in direction of arrow **122** or by displacing the tilting actuator **38** in a combined motion represented by arrow **126**, consisting of displacement along an axial direction thereof (essentially vertical) as well as displacement in an axis parallel to the pivot axis **34** (essentially horizontal).

[0026] Fig. **3B** illustrates the shutter in a position after displacing the slats vertically downwards in the direction of arrow **122**, whereby lateral portion **51** of tilting member **50** extends opposite an opening **56** of the tilting actuator **38**, in a position suitable for engagement therewith. In Fig. **3C** the tilting actuator **38** is shown after further displacement of arrow **126** whereby engaging portion **51** of tilting members **50** are engaged within openings **56**, the slats **32** still at their closed, untitled position.

[0027] Figs. **3D** and **3E** illustrate the shutter with slats **32** in their tilted, namely open position, wherein the tilting actuator **38** is further displaced along direction of arrow **126** further departing from wall portion **36** (Fig. **3D**), wherein the engaging arm portion **51** of tilting member **50** has reached practically the lowermost end of aperture **56** formed in the tilting actuator **38**. It is appreciated, as already mentioned above, that the pattern of aperture **56** dictates the regime by which the slats **36** tilt, namely the tilting rate is dependent from pattern (length and steepness-i.e. the gradient of the opening) of the cam opening **56**.

[0028] As best apparent in Fig. **3E**, the intermediate portion **98** of the tilting member **50** is received between latch **84** and biasing portion **88**, thus ensuring that the tilting member **50** remains engaged with lever arm **78** which constitutes the rigid connection, via pivot axle **34** and stump **72** to tilting of slat **32.**

[0029] Figs. **4A-4C** are top elevations illustrating the shutter assembly in three positions corresponding with Figs. **3A-3D** respectively, wherein tilting actuator **38** is fixed to a vertical frame **133** formed with support rails **134** and **136** which support the guiding member **46** upon its vertical displacement during rolling of the shutter, and which together with extension portion **138** conceal the tilting and locking mechanism so as to prevent tampering therewith. It is to be appreciated that a variety of such frames are possible, depending on particular configuration of the opening etc.

[0030] The position of Fig. **4A** corresponds to either of the positions illustrated in Figs. **3A** and **3B**, wherein the tilting actuator **38** is at its retracted position namely, wherein engaging portion **51** of tilting member **50** is disengaged from the apertures **56** formed in the tilting actuator **38**.

[0031] Fig. **4B** corresponds with the position of Fig. **3C**, wherein the engaging portion **51** of tilting member **50** is engaged within a corresponding aperture **56** of the tilting actuator **38**, thus slats **32** are still in their closed, un-tilted position.

[0032] Fig. **4C** corresponds with the position illustrated in Figs. **3D** and **3E**, wherein the tilting actuator **38** has completed its displacement and has vertically displaced to its extreme position, whereby shutter **32** has tilted into its open position.

[0033] Figs. **5A** to **5C** illustrate an embodiment exemplifying how the tilting actuator **38** may be displaced during a tilting sequence. As already explained above, the tilting actuator **38** is fixed to a wall portion (not shown) by means of straps **40** made for example of a steel-spring leaf which constantly biases the tilting actuator **38** in an axially upward direction and in a horizontal di-

rection away from the slats, as represented by arrow **142**. An eccentric cam actuator **146** is fitted on a shaft of an electric motor **149** whereby rotation of the actuator **146** in the direction of arrow **152** entails displacement of the tilting actuator **38** in direction of arrow **128**, as explained hereinabove, entailing tilting of the slats **32**. However, it is appreciated that manipulating the tilting actuator **38** may be obtained by other arrangement as well, such as, for example, a manual lever, etc.

[0034] As discussed hereinbefore (Figs. 2A and 2B), the intermediate portion **98** of the tilting member **50** is at all times engaged with lever arm **78**, though having sufficient clearance. Furthermore, as noticed from the previous Figures, at the un-tilted, closed position of the slats, portion **102** of the tilting member **50** remains engaged and biased by a biasing member **106** of the block member **90** fitted within guiding member **46**. Thus, when the slats **32** are un-tilted, the biasing effect on portion **102** of the tilting member **50** entails intermediate portion **98** to bear against locking latch **110**, as illustrated in Fig. 6A. When, however, an attempt is made to tilt slat **32** by applying thereto a force in the direction of arrow **164** in Fig. 6B, a corresponding tilting force is applied via pivot axle **34** to lever arm **78**, resulting in clamping of intermediate portion **98** between locking latch **110** and biasing member **88** of lever arm **78**, preventing tilting of the slat **32**. In fact, force applied in the direction of arrow **164** increases the clamping effect of intermediate portion **98** between the locking latch **110** and the biasing portion **88**.

[0035] Preventing tilting of the slats **32** in a counter direction, namely inwards, is prohibited owing to the overlapping engagement of the slats, in accordance with one embodiment, as illustrated, for example, in Figs. **5A** and **5B,** wherein a bottom edge of the slats is formed at an outer face thereof with a projection **182** which overlappingly bears against a corresponding vertical projection **184** formed at a top edge of the slat **32**, thus preventing tilting of the slats inwardly (i.e. in a direction counter to that illustrated in Fig. 5C, i.e. counter clockwise).

[0036] Turning now to Figs. **7A-7C**, the locking mechanism is illustrated in the position (wherein for sake of clarity the actuator removed) in which the tilting mechanism is actuated by applying thereto lateral force represented by arrow **188** imparted thereto by the tilting actuator whereupon the intermediate portion **98** does not engage with the locking latch **110** and whereby it is free to pivot into the position of Fig. **7C**, together with the interlinked lever arm **78**, entailing corresponding tilt of the respective slat **32**.

[0037] It is thus necessary to impart the tilting member **50**, and more specifically the intermediate portion **98** thereof, with an axial degree of freedom, between a position in which it is engagingly arrested by locking latch **110**, and a disengaged position whereby it is free to pivot about the axial portion **96** entailing pivotal displacement of pivot axle **34** and the associated slats.

[0038] Figs. **8A** and **8B** illustrate one embodiment in which the block member **90a** is formed with a recess **92a** which is essentially parallel with recess **93** accommodating the pivot axle (not shown), whereby axial portion **96** is displaceable within recess **92a** only in an axial direction along arrows **192** and **194**, between a locked position illustrated in Fig. **8A**, whereby intermediate portion **98** is arrested by a locking latch **110** and an unlocked position in which intermediate portion **98** is disengaged from locking latch **110**, against the biasing effect of biasing member **106**, as illustrated in Fig. **8B**.

[0039] A different embodiment is illustrated in Figs. **9A** and **9B,** wherein the block member **90b** is formed with a recess **92b** slantingly extending with respect to recess **93** accommodating the pivot axle **34** (not shown) whereupon the tilting member **50** is swingably displaceable along arrows **196** and **198** between a locked position illustrated in Fig. **9A**, wherein intermediate portion **98** is arrested by locking latch **110** and an unlocked position, against the biasing effect of biasing member **106**, whereby intermediate portion **98** is disengaged from locking latch **110**.

[0040] Figs. 10A-10H illustrate different biasing arrangements for biasing a tilting member into engagement with a locking latch **110** of a block member. In all the illustrated embodiments the respective block member pivotally accommodates a pivot axle **334** connecting lever arm **78** with slat **32** as disclosed in connection with all the previous embodiments. In the embodiment of Fig. 10A block member **200** accommodates an axle portion **202** received within a bore **204** and biased by means of coiled spring **206** bearing at one end against a shoulder **208** of the block member **200** and at an opposed end against an annular rim **210** of the axle portion **202**, biasing the tilting member, namely the intermediate portion **212** in the direction of arrow **214**.

[0041] In the embodiment of Fig. 10B tilting member is biased in the direction of arrow **220** by means of a compression spring **222** fitted within a bore formed in block member **224** applying force on the axle portion of the tilting member.

[0042] The embodiment of Fig. 10C is similar to the embodiment of Fig. 10B, whereby a leaf-type spring **230** received within a recess **232** applies biasing force on axial portion **236** of the tilting member, thus biasing it in the direction of **238**.

[0043] In the embodiment of Fig. 10D a different concept is illustrated wherein arm portion **240** of the tilting member is articulated to one end of a coiled spring **242,** another end thereof fixed within the stump portion **246** within the slat **32**, thus giving rise to a biasing force in the direction of arrow **248**.

[0044] The arrangement illustrated in Fig. 10E comprises a leaf-type spring **250** having a first arm **252** secured to block member **254** and a second arm **256** secured to axle portion **258** of the tilting member, whereby the leaf-spring is a compression spring in which arm **256** is biased towards arm **252,** giving rise to biasing the in-

termediate arm **260** in the direction of arrow **262.** A similar arrangement is disclosed in Fig. 10F, wherein a biasing arm **270** made of a resilient material is integral with the block member **272** and engaged with an end of axle portion **276**, giving rise to a tilting biasing force in the direction of arrow **280**.

[0045] Fig. 10G discloses a block member **284** formed with an integral spring portion **286** bearing against axle portion **288** and biasing it in the direction of arrow **290.** The biasing arrangement of Fig. 10H comprises a leaf-type spring **294** riveted at **296** to lever arm **78**, with an opposed end thereof **298** bearing against the intermediate portion **300**, thus giving rise to a biasing force in the direction of arrow **306**.

Claims

1. An adjustable shutter comprising a plurality of slats parallelly extending at adjoining relationship, each slat comprising a pivot axis parallel to a longitudinal direction thereof; each slat associated with a tilting mechanism at least at one end thereof, said tilting mechanism engageable with a corresponding tilting actuator displaceable in an axial direction normal to the pivot axis; the slats being linked to one another at adjoining edges of neighboring tilting mechanisms; each tilting mechanism comprises a guiding member and a tilting member whereby displacing the tilting actuator entails tilting of the slats about said pivot axis between open and closed positions, and whereby the slats are displaceable in the axial direction.

2. An adjustable shutter according to claim **1**, wherein the guiding members of the slats are displaceable along support rails fitted at both ends thereof.

3. An adjustable shutter according to claim **1**, wherein the tilting actuator disengages from the tilting member to enable displacement of the slats along said support rails.

4. An adjustable shutter according to claim **1**, wherein the tilting member is a pin extending parallel to said pivot axis.

5. An adjustable shutter according to claim **2**, wherein the tilting actuator is a cam-type member and the tilting member is a follower-type member.

6. An adjustable shutter according to claim **2**, wherein the tilting actuator is a strap of rigid material formed with plurality of openings each defining a cam path engageable with a corresponding tilting member, the tilting actuator being displaceable in the axial direction so as to effect tilting of the slats, and in a direction parallel to the pivot axis so as to effect respective engagement and disengagement thereof with the respective tilting members of the slats.

7. An adjustable shutter according to claim **1**, wherein the slats are rollable over a pickup axis parallel to the pivot axis of the slats.

8. An adjustable shutter according to claim **1**, wherein each slat has a top edge and a bottom edge, where a bottom edge of one slat overlaps a top edge of a an adjacent slat.

9. An adjustable shutter according to claim **8**, wherein the top edge of one slat is receivable by a bottom edge of a an adjacent slat

10. An adjustable shutter according to claim **1**, further comprising a locking mechanism associated with the tilting mechanism, said locking mechanism facilitating tilting of the respective slat only via the tilting mechanism and preventing tilting of the slats when by tilting the slats.

11. An adjustable shutter according to claim **3**, wherein each slat may be tilted any location along the axial direction.

12. An adjustable shutter according to claim **1**, wherein the slats are linked to one another via interlining members linked at adjoining edges of guiding members of neighboring tilting mechanisms.

13. An adjustable shutter according to claim **10**, wherein the tilting member is engageable with the actuating member for imparting thereto pivotal displacement to facilitate tilting of a slat, and being arrested by a locking latch fixed to the guiding member when the slat is in a tilted position.

14. An adjustable shutter according to claim **13**, wherein when an attempt is made to tilt a slat when at its closed position, the tilting member is arrested by the locking mechanism, whereby the slat is retained locked at the closed position.

15. An adjustable shutter according to claim **1**, wherein the tilting mechanism comprises a pivot axle fixedly attached to a respective slat and pivotally extending through an associated guiding member, and a laterally extending tilting member engageable with the tilting actuator and coupled with a lever arm fixed onto said pivot axle, for pivotal displacement therewith.

16. An adjustable shutter according to claim **15**, wherein the lever arm comprises a biasing portion for displacing the tilting member towards a locking latch fixed to the guiding member, whereby when a slat

is in the closed position and an attempt is made to tilt the slat, the biasing portion displaces the tilting member into arresting engagement with the locking latch, thus preventing tilting of the slat.

17. An adjustable shutter according to claim **15**, wherein at the closed position of a slat, the tilting member is biased towards the locking latch.

18. An adjustable shutter according to claim **15**, wherein the guiding member is fitted with a biasing member for biasing the tilting member towards the locking latch.

19. An adjustable shutter according to claim **15**, wherein the tilting member comprises an axle portion pivotally articulated to the guiding member, and intermediate portion interacting with the lever arm, and a free arm, parallel with the axle portion and being engageable with the tilting actuator.

20. An adjustable shutter according to claim **19**, wherein the axle portion of the tilting member is spring biased so as to bias the intermediate portion towards the locking latch.

21. An adjustable shutter according to claim **16**, wherein engagement of the tilting member with the tilting actuator entails disengagement of the tilting member from the locking latch.

22. An adjustable shutter according to claim **19**, wherein the axle portion of the tilting member is axially displaceable with respect to the guiding member, between a position in which the intermediate portion is engaged from the locking latch and a position in which the intermediate portion is disengaged from the locking latch.

23. An adjustable shutter according to claim **19**, wherein the axle portion of the tilting member is pivoted to the guiding member parallelly offset with respect to the pivot axle.

24. An adjustable shutter according to Claim **19**, wherein the tilting member further comprises a stem portion fixedly extending from the axle portion and fitted for engagement with a slat.

25. A locking mechanism for an adjustable shutter comprising a plurality of slats parallelly extending at adjoining relationship and supported to a frame by a guiding member at each respective end thereof, each slat comprising a pivot axis parallel to a longitudinal direction thereof; each slat associated with a tilting mechanism at least at one end thereof engageable with an tilt actuator; said locking mechanism facilitating tilting of the respective slat only via the tilting mechanism and preventing tilting of the slats when by tilting the slats.

26. A locking mechanism for an adjustable shutter according to claim **25**, wherein the tilting mechanism comprises a tilting member arrestable by a locking latch fixed to the guiding member when a slat is in a tilted position.

27. A locking mechanism according to claim **26**, wherein when an attempt is made to tilt a slat when at its closed position, the tilting member is arrested by the locking mechanism, whereby the slat is retained locked at the closed position.

28. A locking mechanism according to claim **25**, wherein a lever arm of the tilting mechanism comprises a biasing portion for displacing the tilting member towards a locking latch fixed to the guiding member, whereby when a slat is in the closed position and an attempt is made to tilt the slat, the biasing portion displaces the tilting member into arresting engagement with the locking latch, thus preventing tilting of the slat

29. A locking mechanism according to claim **25**, wherein at the closed position of a slat, the tilting member is biased towards the locking latch.

30. A locking mechanism according to claim **25**, wherein the guiding member is fitted A locking mechanism according to claim **25**, wherein

31. A locking mechanism according to claim **25**, wherein the slats are rollable over a pickup axis parallel to the pivot axis of the slats.

32. A locking mechanism according to claim **25**, wherein an axle portion of the tilting member pivotally articulated to the guiding member and is spring biased so as to bias an intermediate portion of the tilting member towards the locking latch.

33. A locking mechanism according to claim **25**, wherein engagement of the tilting member with the tilting actuator entails disengagement of the tilting member from the locking latch.

34. A locking mechanism according to claim **25**, wherein respective ends of the slats are received within support rails, whereby the locking mechanism and the tilting mechanism are concealed.

35. A tilting mechanism for an adjustable shutter comprising a plurality of slats parallelly extending at adjoining relationship, each slat comprising a pivot axis parallel to a longitudinal direction thereof; the tilting mechanism comprising a tilting member en-

gageable with a tilting actuator displaceable in an axial direction normal to the pivot axis; whereby displacing the tilting actuator entails tilting of the slats about said pivot axis between open and closed positions, and whereby the slats are displaceable in the axial direction.

36. A tilting mechanism according to claim **35**, further comprising a guiding member associated with each slat and being displaceable along a guide rail supporting the shutter at both ends thereof.

37. A tilting mechanism according to claim **35**, wherein the tilting actuator disengages from the tilting member to enable displacement of the slats along said support rails.

38. A tilting mechanism according to claim **35**, wherein the tilting member is a pin extending parallel to said pivot axis.

39. A tilting mechanism according to claim **35**, wherein the tilting actuator is a cam-type member and the tilting member is a follower type member.

40. A tilting mechanism according to claim **35**, wherein the tilting actuator is a strap of rigid material formed with plurality of openings, each defining a cam path engageable with a corresponding tilting member, the tilting actuator being displaceable in the axial direction so as to effect tilting of the slats, and in a direction parallel to the pivot axis so as to effect respective engagement and disengagement thereof with the respective tilting members of the slats.

41. A tilting mechanism according to claim **35**, wherein at a state at which the tilting members are disengaged from the tilting actuator, the shutter is rollable along the support rails.

42. A tilting mechanism according to claim **36**, wherein the tilting actuator is received within the support rails in a concealed manner.

43. A tilting mechanism according to Claim **35**, wherein the tilting member is fitted with a stem portion fitted for fixedly attaching to an end of a respective slat.

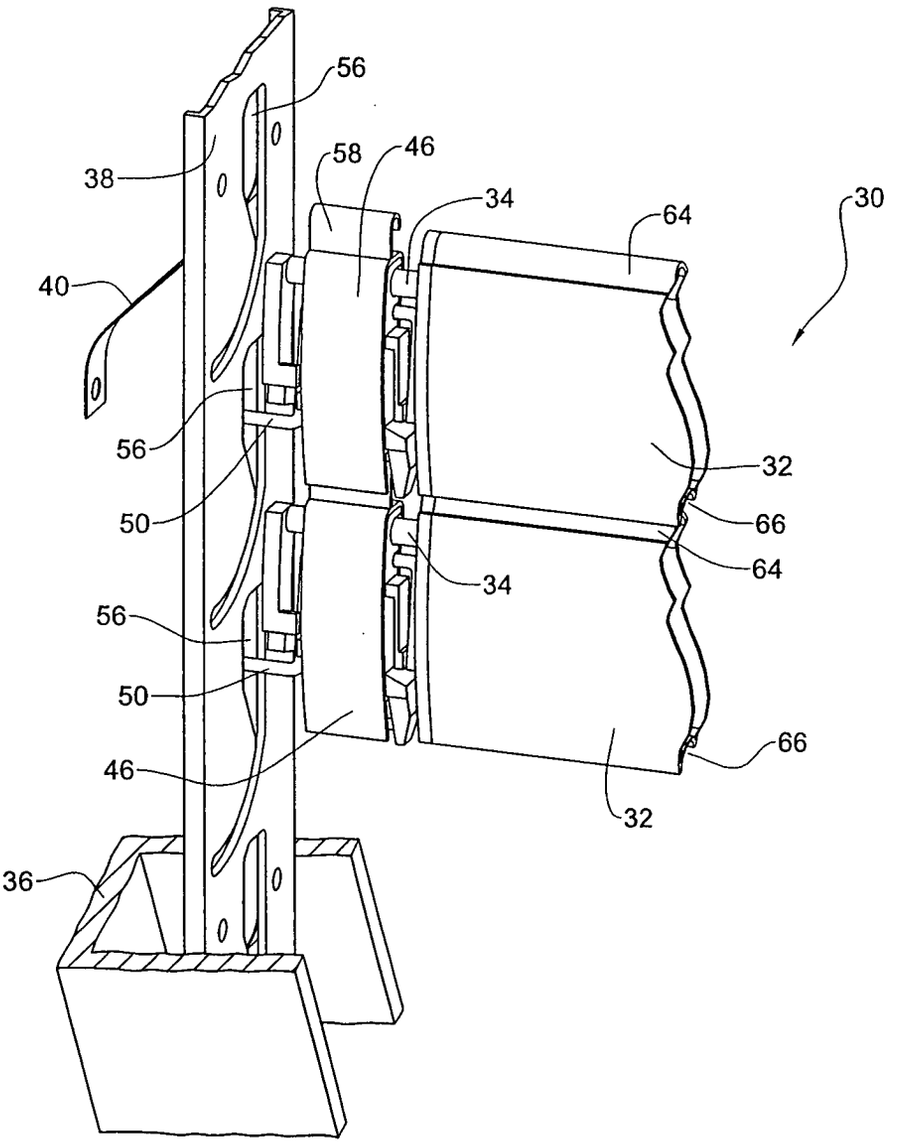

FIG. 1A

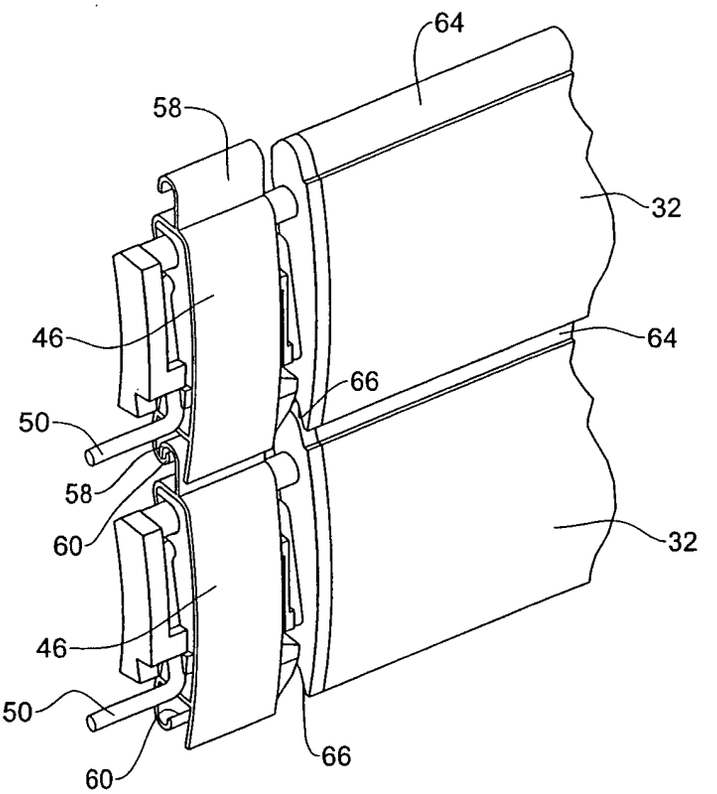

FIG. 1B

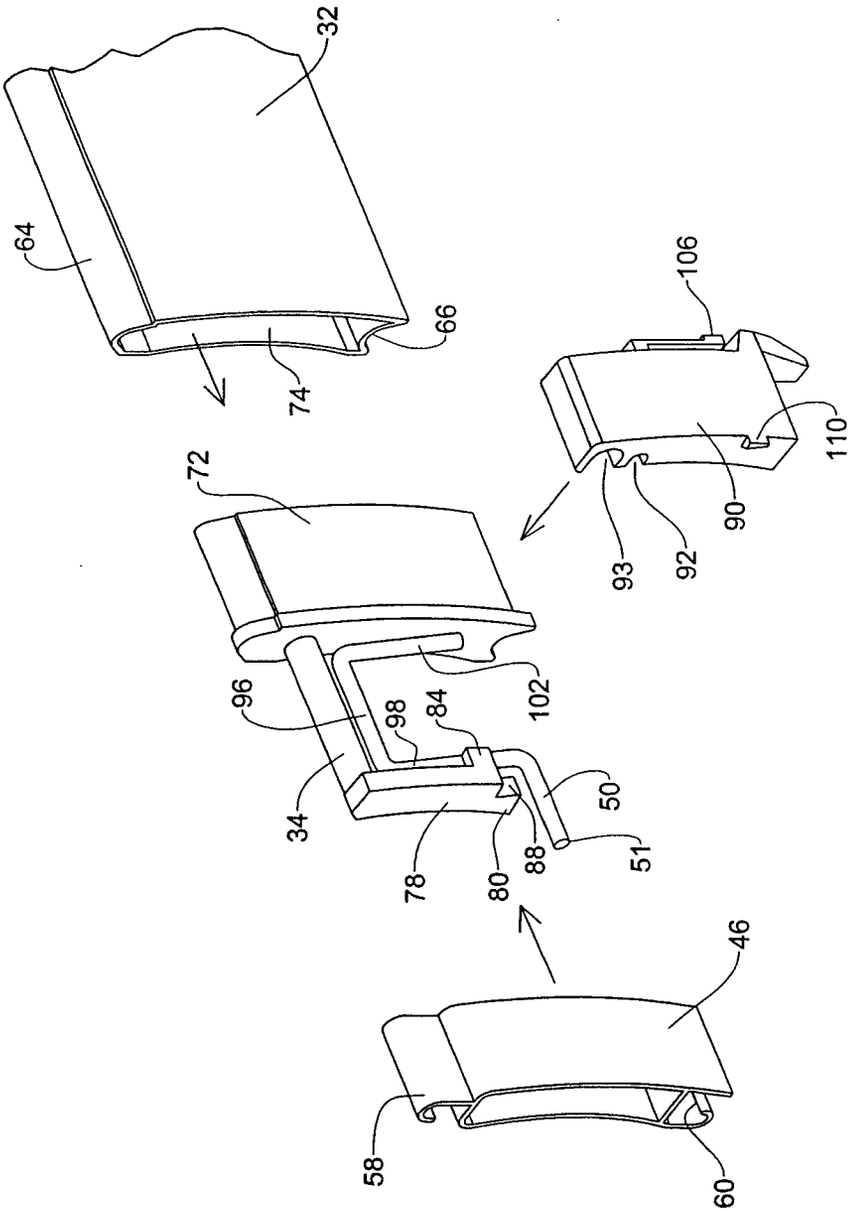

FIG. 2A

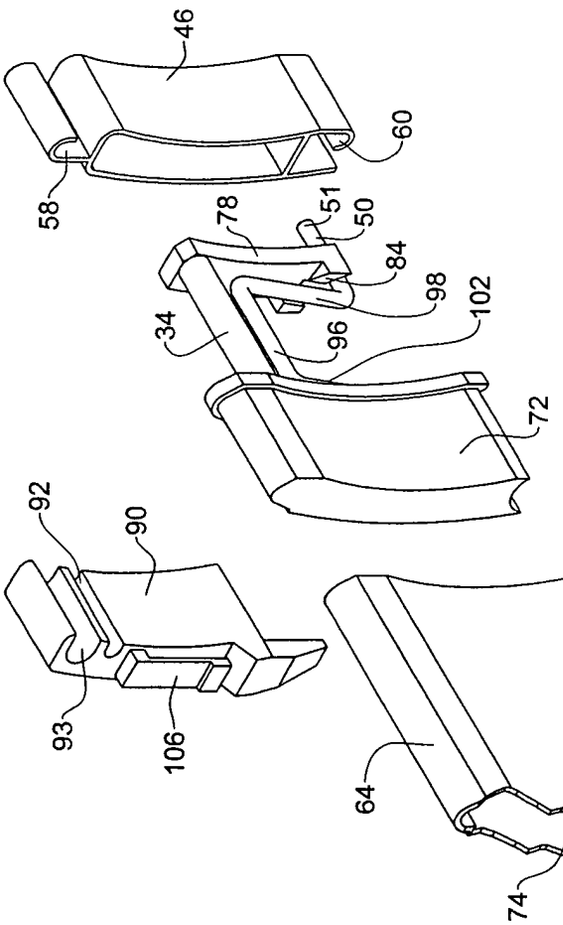

FIG. 2B

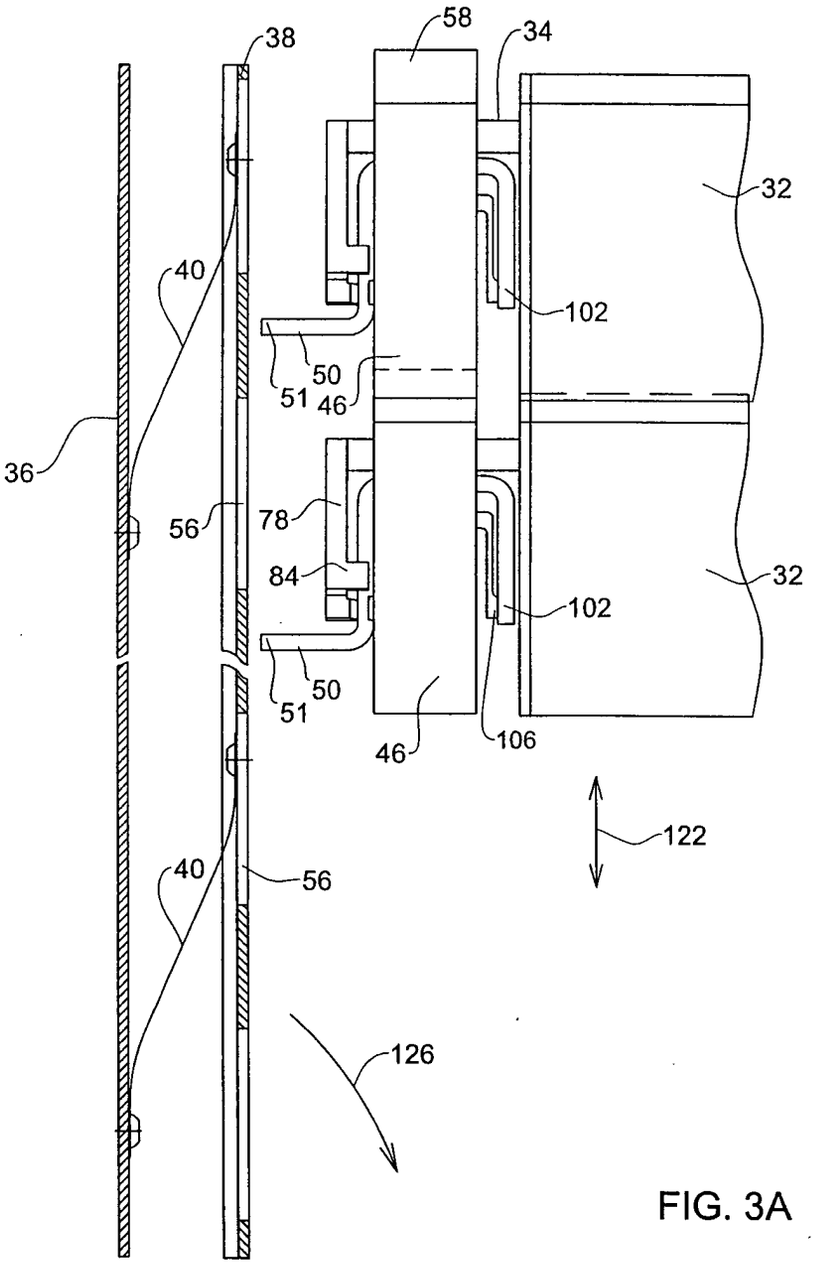
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FIG. 3A

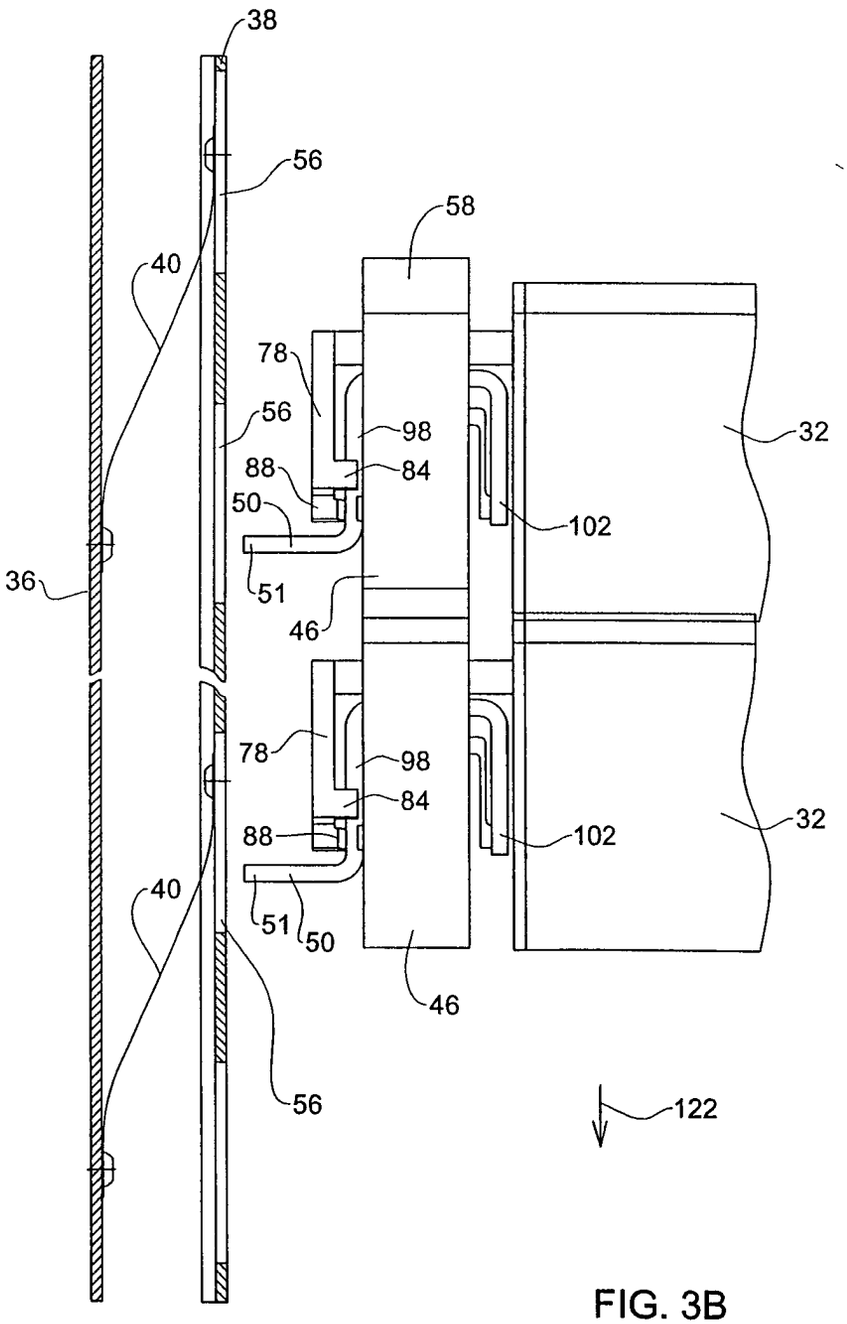
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FIG. 3B

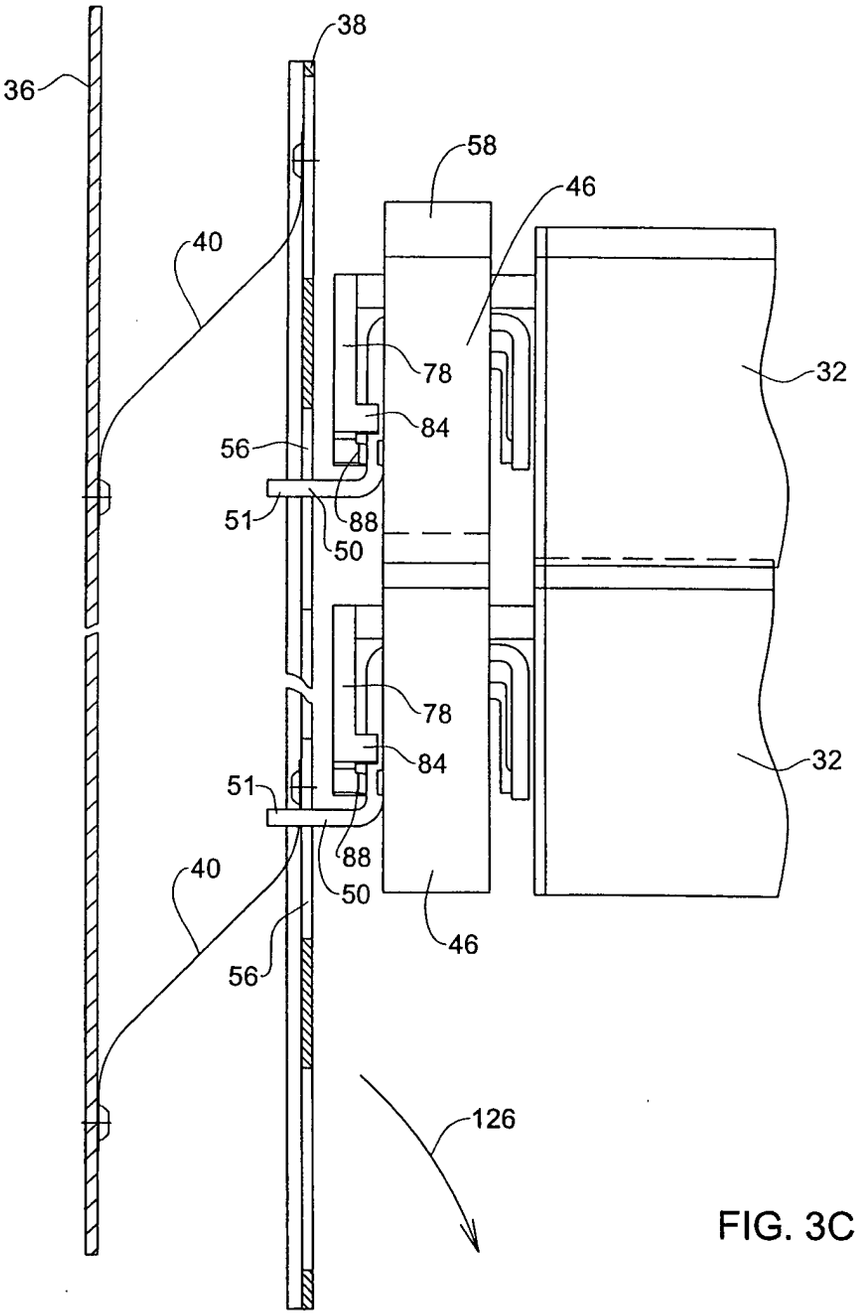

FIG. 3C

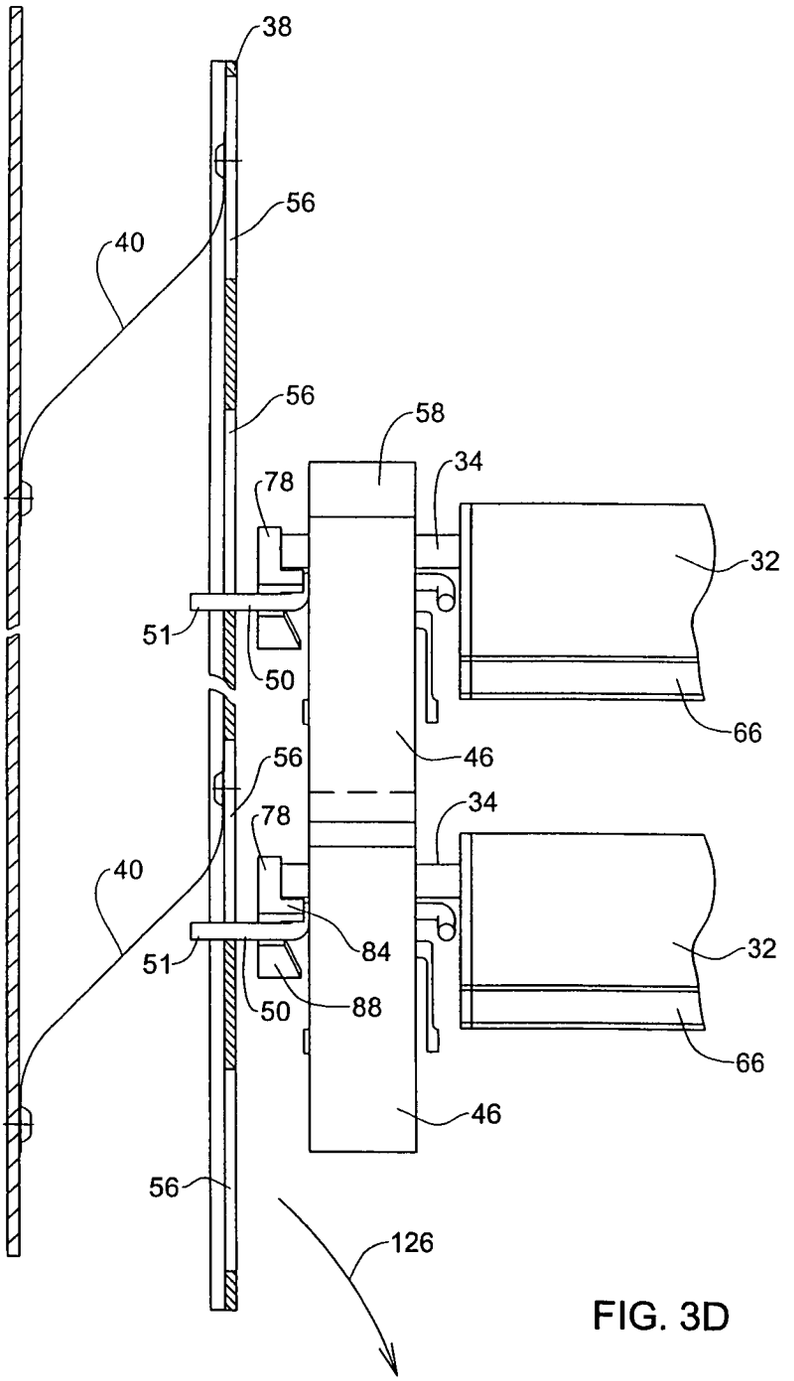
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FIG. 3D

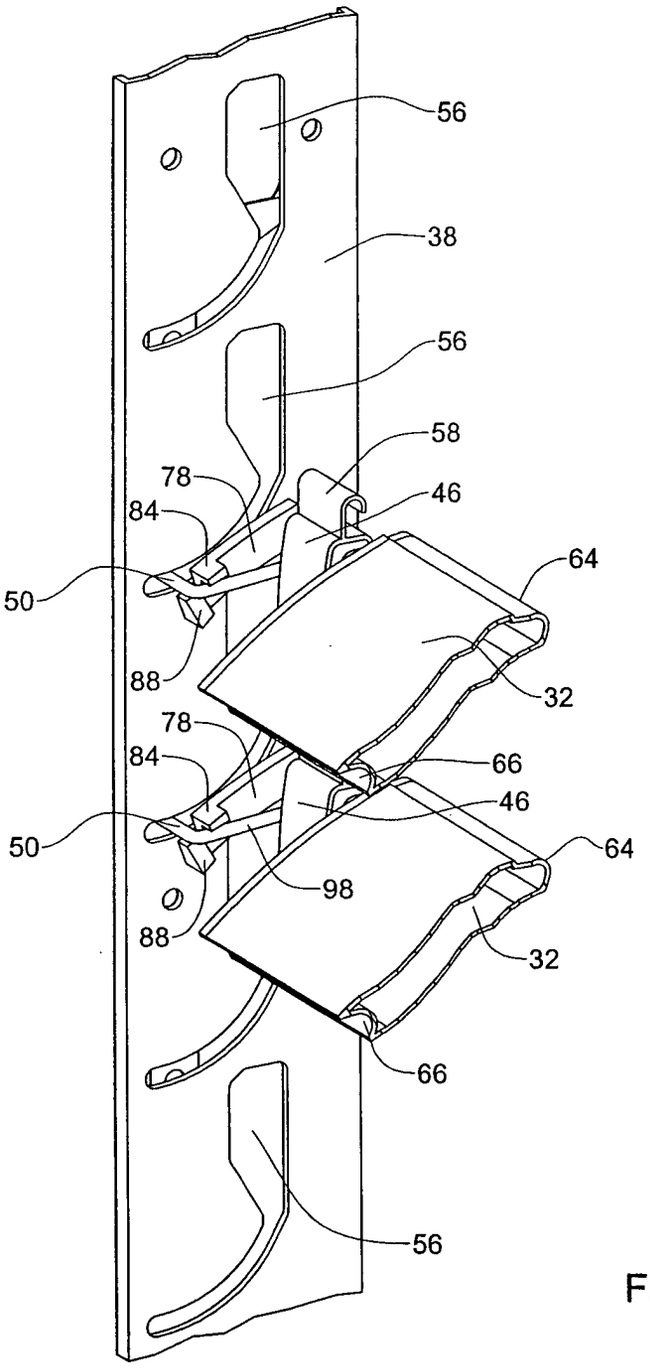

FIG. 3E

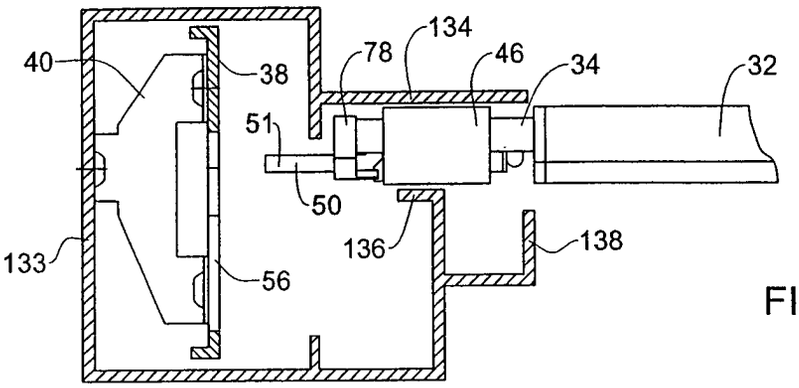

FIG. 4A

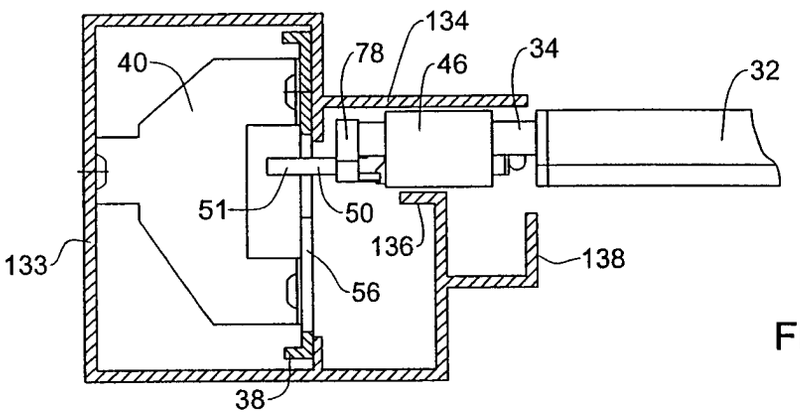

FIG. 4B

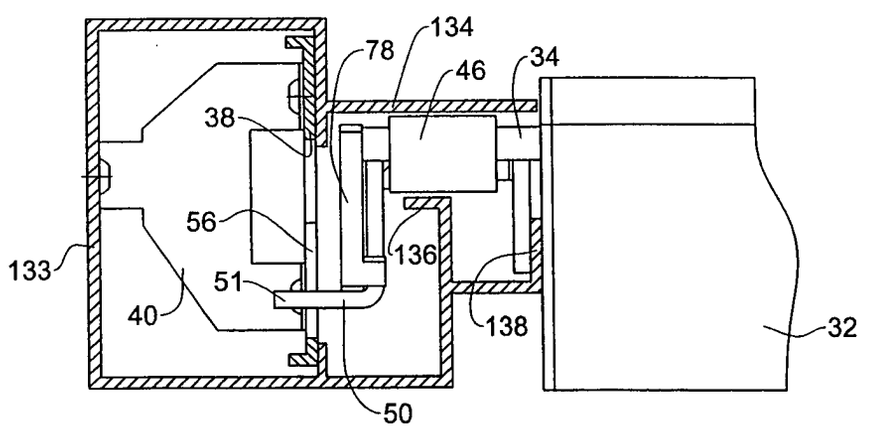

FIG. 4C

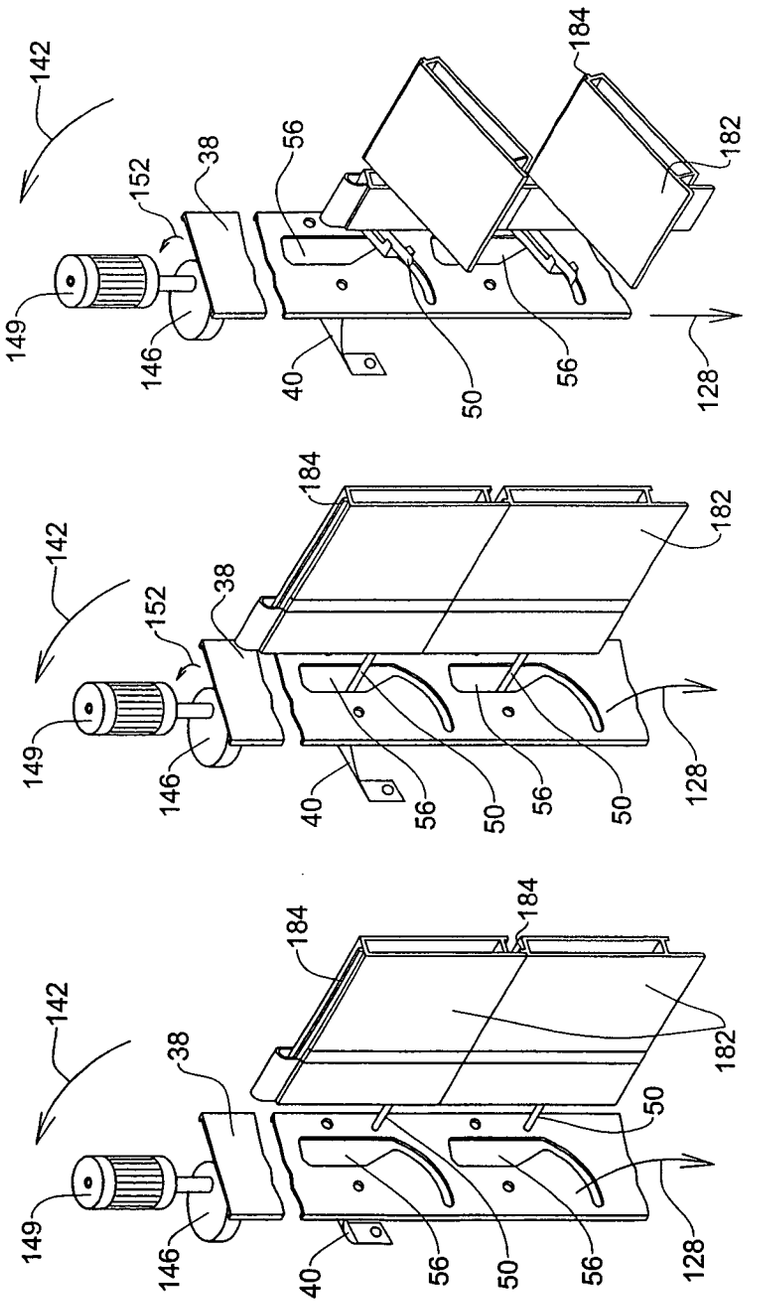

FIG. 5C

FIG. 5B

FIG. 5A

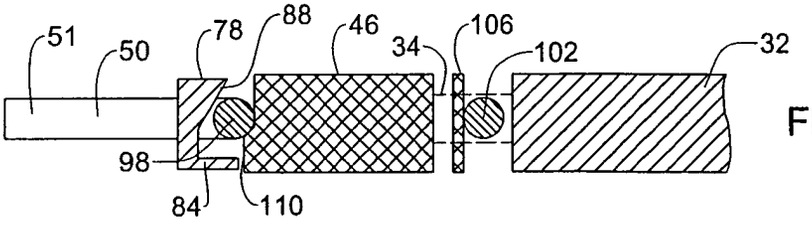

FIG. 6A

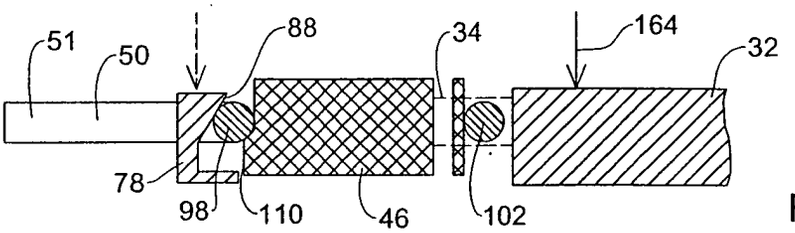

FIG. 6B

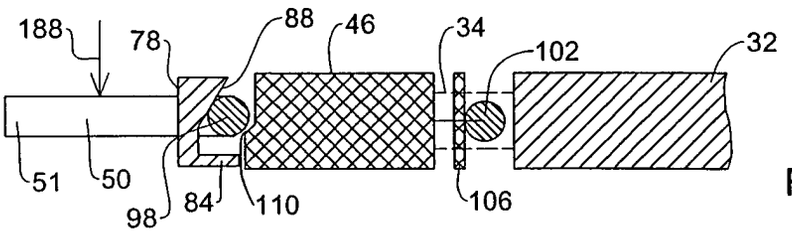

FIG. 7A

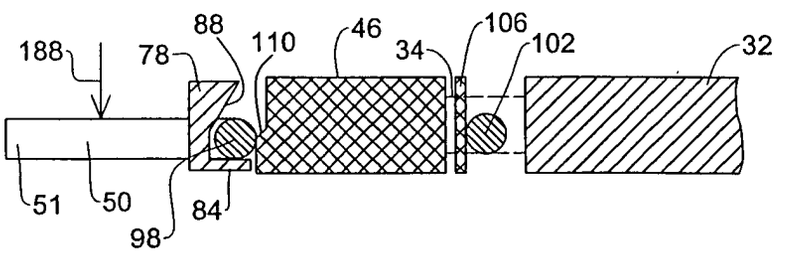

FIG. 7B

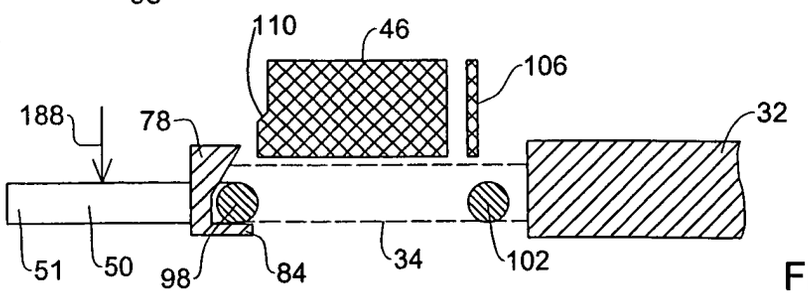

FIG. 7C

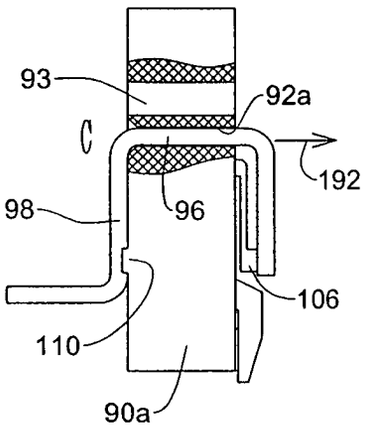

FIG. 8A

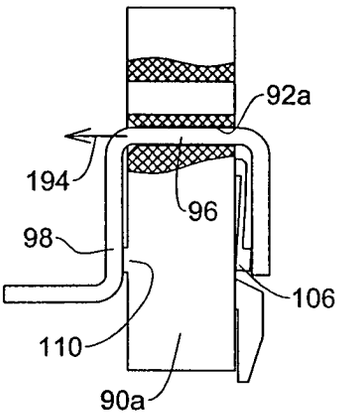

FIG. 8B

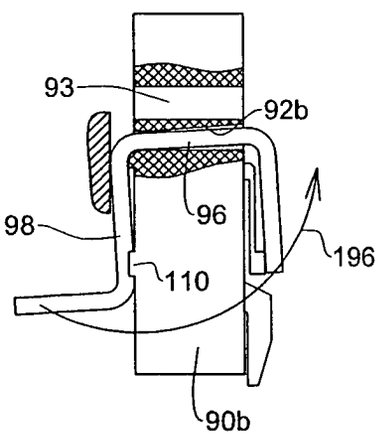

FIG. 9A

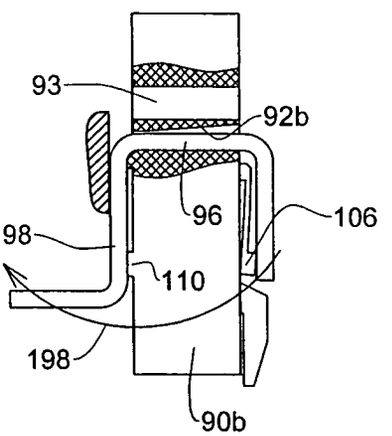

FIG. 9B

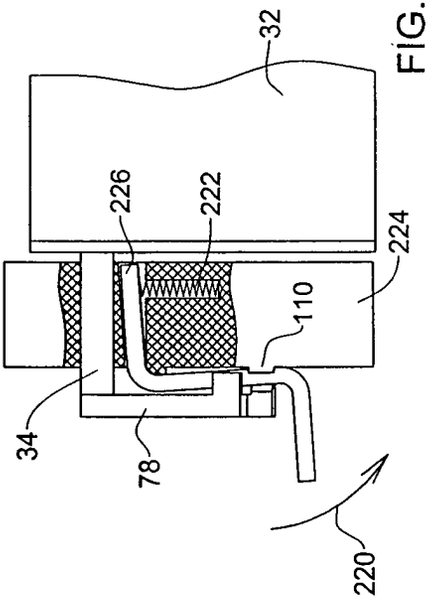

FIG. 10B

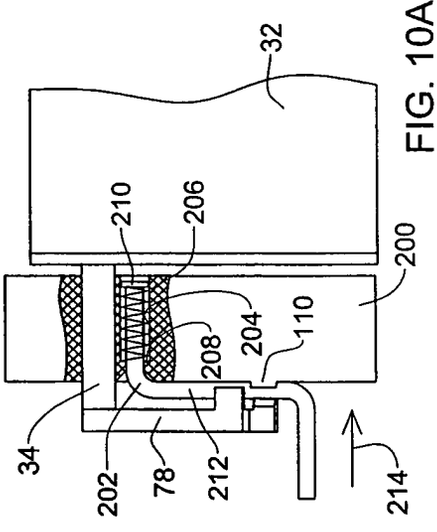

FIG. 10A

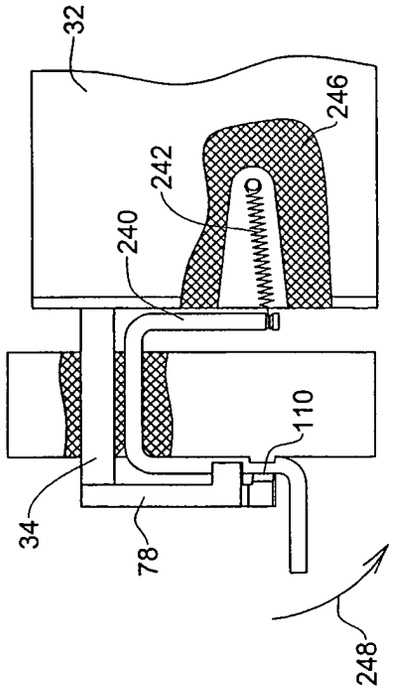

FIG. 10D

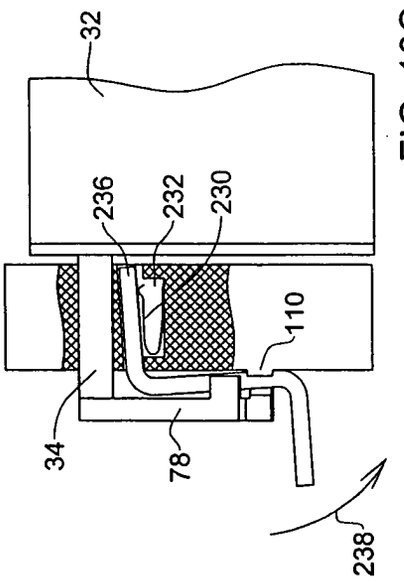

FIG. 10C

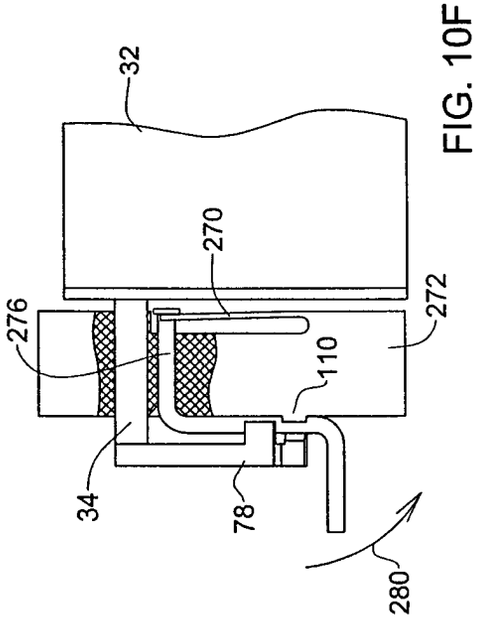

FIG. 10F

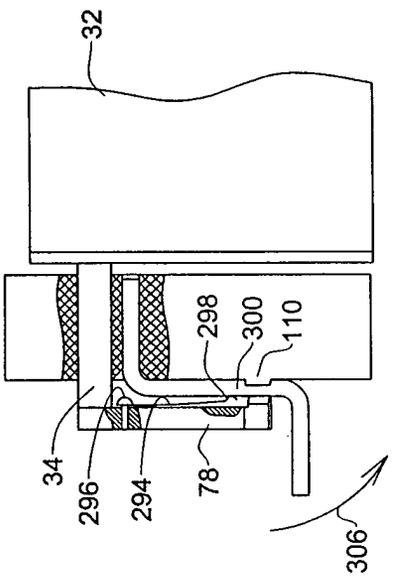

FIG. 10H

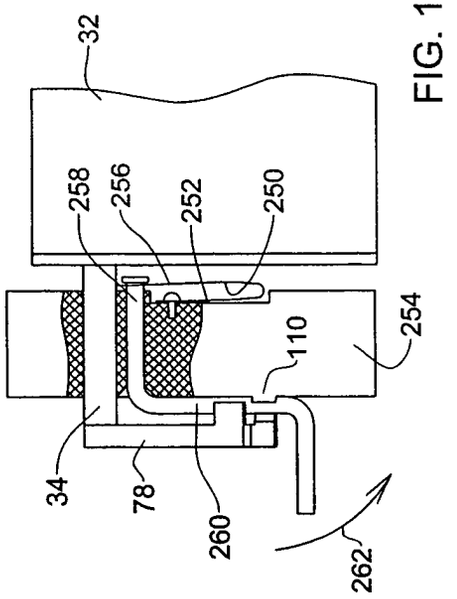

FIG. 10E

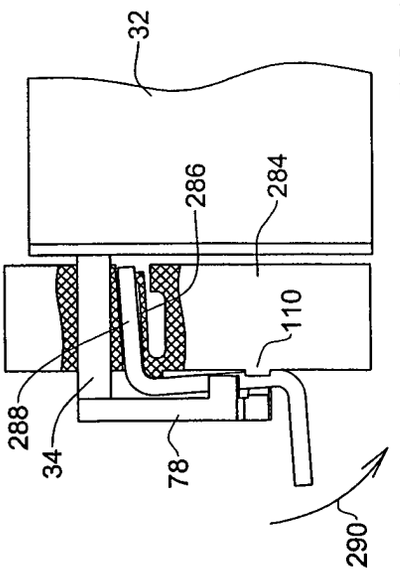

FIG. 10G