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(54) Improvements in glazing systems

(57) A glazing structure comprises a plurality of glass panels (1-6). The panels are interconnected by fittings (7,27) and a beam (12) extending across the width of the glass panels for preventing lateral flexure of the glass panels. The fittings (7,27) are fastened to each glass panel against an edge thereof and linking rods (11) are connected between adjacent fitting (7,27) and to the beam (12). The linking rods are slidably mounted in the fittings (7,27) but are prevented from sliding movement by a fusible plug. In the event of a fire the plug melts. The expansion of the supporting beam (12) is accomodated by relative movement between the beam (12) and the fittings (27) (and hence between the beam and the glass panels) by virtue of the sliding mount. This ensures that the expansion takes place without the glass panels being drawn apart.

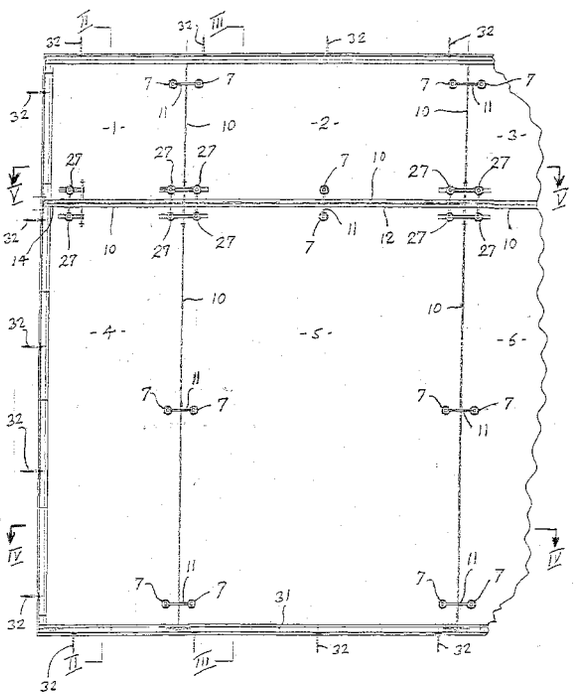

Fig. 1

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Description

[0001] This invention relates to improvements in glazing systems and is particularly concerned with a system for supporting large glass panels for ensuring that the installation of such panels meets the most stringent fire regulations.

[0002] Large glass panels used in offices and the like are butt-jointed with the use of a suitable intumescent compound and, in the event of a fire, the compound can intumesce. The glass panels are normally supported in a metal frame. Stainless steel expands by up to 12mm per metre at a temperature of 1000°C while mild steel expands by up to 8mm per metre at the same temperature. The expansion of the metal frame can cause the joints to open in conventional glazing systems so that fire can break through the joints or cause glass to fracture.

[0003] The present invention aims to provide a glazing system which avoids the disadvantages of conventional glazing systems and which is resistant to fire.

[0004] According to a first aspect of the present invention, there is provided a glazing structure comprising a plurality of glass panels, at least one fitting fastened to each glass panel adjacent to an edge thereof and a linking member interconnecting adjacent fittings and therefore adjacent glass panels, wherein the linking member is connected to at least one of the fittings via a fusible member that is made of a material with a predetermined fusing point such that in the event of a fire the fusible member fuses and permits relative movement between the linking member and the respective fitting.

[0005] Thus, with the structure according to the invention, in the event of a fire the fusible member fuses and the linking member can expand without the glass panels being drawn apart.

[0006] According to a second aspect of the present invention there is provided a structure for supporting a plurality of glass panels comprising a beam for extending across the glass panels, at least one fitting fastened to each glass panel adjacent to an edge thereof and a linking member connected to adjacent fittings and to the beam, wherein the linking member is connected to the fittings such that relative movement can take place between the beam and the fittings and hence between the beam and the glass panels, the movement being in a direction that is substantially parallel to the plane of the glass panels.

[0007] The invention will now be described in detail, by way of example, with reference to the drawings, in which:-

Fig. 1 is a front elevation of one embodiment of a glazing system according to the invention;

Fig. 2 is a section taken on the line II-II in Fig. 1 in the direction of the arrows;

Fig. 3 is a section taken on the line III-III in Fig. 1 in the direction of the arrows;

Fig. 4 is a section taken on the line IV-IV in Fig. 1 in the direction of the arrows;

Fig. 5 is a section taken on the line V-V in Fig. 1 in the direction of the arrows;

Fig. 6 shows, to an enlarged scale, the area indicated within the chain-dotted line VI in Fig. 2;

Fig. 7 shows, to an enlarged scale, the area indicated within the chain-dotted line VII in Fig. 3;

Fig. 8 shows, to an enlarged scale, the area indicated within the chain-dotted line VIII in Fig. 3;

Fig. 9 shows, to an enlarged scale, the area indicated within the chain-dotted line IX in Fig. 5;

Fig. 10 shows, to an enlarged scale, the area indicated within the chain-dotted line X in Fig. 5; and

Figure 11 a is an end view of a fitting forming part of the present invention;

Figures 11b and 11c are sectioned views of figure 11a along lines A-A and B-B respectively.

[0008] In the drawings, like parts are denoted by like reference numerals.

[0009] Referring to the drawings, a first series of glass panels 1, 2, 3 are butt-jointed at their adjacent vertical edges and a second series of glass panels 4, 5, 6 are likewise butt-jointed at their adjacent vertical edges, the second series of glass panels being butt-jointed to the first series of glass panels at adjacent horizontal edges. The voids between the butt-jointed panels are filled using an intumescent compound 10 and the assembled panels are held in a surrounding frame.

[0010] Bores are provided adjacent the edges of each panel which are butt-jointed to adjacent panels for the reception of fittings 7 and 27. Each fitting comprises a spigot which is secured to a respective panel by a screw 8, the head of the screw butting against one side of the panel while the base of the spigot, which has a screw-threaded bore to receive the screw butts against the other side of the panel, preferably with the interposition of washers 9. Each fitting 7, 27 is further provided with a transverse bore of the reception of a connecting rod 11, the bores and the connecting rods extending substantially vertically or horizontally depending on whether the butt-joint between the adjacent panels on which the fittings are mounted extends substantially horizontally or vertically.

[0011] With a panel assembly as shown in the drawings, it is often necessary to provide reinforcing means

to prevent lateral flexure of the panels. This is achieved according to the invention by means of a pair of lateral beams 12 and 13 which extend substantially horizontally across the frame 31 from one side to the other. Each beam at each end is slidably fitted on a respective spigot 14, the spigots at each end of the beams being mounted on respective plates 26 which are secured to the respective vertical sides of a structure surrounding the frame (only one side shown in the drawings). The beams 12 and 13 are shorter than the distance between the vertical sides of the frame to permit expansion of the beams. As shown in Fig. 3, the beams are maintained in place, intermediate their ends, by cables 15, 16 and 17, 18. Each cable terminates at each end in a connector 19. The upper connectors 19 of the upper cables 15 and 16 are pivotally connected to a mounting block 21 which is mounted on the structure surrounding the frame 31 at the upper side thereof. The lower connector 19 of the upper cable 15 is pivotally connected to the upper end of a first support arm 22 while the lower connector of the upper cable 16 is pivotally connected to the upper end of a second support arm 23. The support arms 22 and 23 are connected by a bracing bar 24. The upper connector 19 of the lower cable 17 is pivotally connected to the lower end of the first support arm 22 while the upper connector 19 of the lower cable 18 is pivotally connected to the lower end of the of the second support arm 23. The lower connectors 19 of both lower cables 17 and 18 are pivotally connected to a mounting block 21 which is mounted on the structure surrounding the frame at the lower side thereof. The mounting blocks 21 are desirably mounted on plates 25 which are secured to the said surrounding structure by screws 29. Shims 30 may be provided between the plates 25 and the surrounding structure and also between the plates 26 and the surrounding structure.

[0012] The beams 12 and 13 preferably extend across the frame in the region of the horizontal butt-joints between the panels 1 and 4, 2 and 5 and 3 and 6. Because the beams will expand more than the glass panels in the event of a fire, it is necessary to compensate for this expansion by employing a different form of fitting 27 in these regions. These fittings are fitted to the comers of the panels 1, 2, 4 and 5 and 2, 3, 5 and 6 where the panels are jointed to one another as shown in Fig. 1 of the drawings. Each fitting 27 comprises a spigot which is secured to a respective panels by a screw 8, the head of the screw butting against one side of the panel while the base of the spigot, which is provided with a screw-threaded bore to receive the screw, butts against the other side of the panel, preferably with the interposition of washers 9.

[0013] Each fitting 27 is further provided with a pair of transverse bores spaced from each other and mutually perpendicular to each other. The fittings are so arranged on the panels that one bore extends substantially vertically while the other bore extends substantially horizontally.

[0014] The fitting in panel 1 is connected to the fitting in panel 4 by a vertical connecting rod 11 which is located in the vertical bores in the two fittings 27 and, in a similar manner, the fitting in panel 2 is connected to the fitting in panel 5 by another vertical connecting rod 11 located in the vertical bores in the fittings 27. The panels 3 and 6 are connected in a similar manner.

[0015] Linking rods 28 are located in the substantially horizontal bores in the fittings 27 in the panels 1 and 2, 4 and 5, 2 and 3 and 5 and 6, said linking rods preferably being relatively freely slidable in the bores. The linking rods 28 are secured to respective support arms 22 which in turn are mounted on the beam 12. In the event of a fire, the beams 12 and 13 will expand more than the glass but the slidable connection between the linking rods 28 and fittings 27 will ensure that the glass panels are not forced apart by the expansion of the beams because the linking rods 28, which are connected to the beam 12 by the support arm 22, can move with the beam by sliding along the bores in the fittings 27 as they do so.

[0016] The fittings 27 may also be connected to support arms 22 on the beam 12 in regions at which no cables are pivotally mounted on the support arms as shown in Figs. 2 and 6 of the drawings. In this arrangement the vertically offset fittings are connected to the common support arm 22 that in turn is connected to one end of a linking rod 28. The linking rod is received in a horizontal bore of the spigot as before. This arrangement may be used in place of the arrangement of fittings 7 shown mid-way along the length panels 2 and 5.

[0017] The frame 31 is substantially rectangular and is secured in a surrounding structure by a series of screws 32. A ceramic fibre in-fill 33 is desirably provided between the base of the frame and the surrounding structure and sealed in place by a fire-rated silicon seal 34. As shown in Fig. 8, the frame is substantially U-shaped in cross section and the edges of the glass panels are held in the frame by glazing beads 35 which are secured to the base of the frame by screws 36. A glazing tape 37 is applied to the edge of the glass panel on both sides and the base of the frame is filled with an in-fill block 38 of a suitable flexible insulating material. The advantage of the glazing beads is that the frame can be hidden by a floor or ceiling and yet the glass panels can be readily replaced if necessary without having to remove the frame from the structure.

[0018] The ends of the beams 12 and 13 can be clamped to the respective spigots 14 by clamping screws 41 with the interposition of clamping washers 42 but the clamping is such that the relative movement between the beams and the spigots can take place in the event of beam expansion at elevated temperatures. Slots 43 are provided in the beams for this purpose as shown in Fig. 9 of the drawings.

[0019] The linking rods 28 may normally be secured to the respective spigots 27 against relative movement by plugs 44 which are secured in place by grub screws 45. The plugs are made of a material having a low melt-

ing point so that, in the event of fire, the plugs will melt and the above-described relative movement between the linking rods 28 and the spigots 27 can still take place. The advantage of this arrangement is that the rods 28 can be a loose fit in the bores in the fittings 27 so that relative movement can take place readily in the event of a fire.

[0020] Figures 11a, 11b and 11c show the spigot 27 and plug 44 in more detail. The plug is in the form of a sleeve 50 that lines the bore 51 in the spigot 27. The sleeve is manufactured from a suitable metal alloy or other material that is designed to melt or otherwise fuse at a predetermined temperature. The linking rod 28 is received in the bore 51 as a friction fit with the sleeve 50 and the sleeve is held in place by a grub screw (not shown in figure 11) that is received in threaded aperture 52. The sleeve may be secured to the spigot by other means such as bonding. When the sleeve melts or fuses it leaves an annular clearance between the linking rod and the wall of the bore so as to permit relative axial movement between the two.

[0021] The in-fill block 38 need only be provided along the bottom of the frame. The purpose of the block is to support the panels in the event of a fire when the cables will expand and no longer support the beams. The panels can drop by as much as 5mm but they will then be supported by the in-fill block 38 on which the bottoms of the panel will rest.

[0022] In the specific embodiment illustrated in the figures, the fitting pairs 7 disposed along the vertical edges of abutting panels are not shown connected to a supporting beam. However, it is to be understood that such fittings may be connected, in the manner described above to a supporting beam that may be disposed in the horizontal or vertical direction. Where the beam is disposed in a vertical direction the associated cables are disposed in the horizontal direction.

[0023] In certain applications the beams may not be required at all. However the same connection between adjacent fittings securing adjacent panels together is required to accommodate any expansion of the connecting rods 11. In this case the same melting plug design is used to interconnect the fittings and the connecting rod so as to allow relative movement of the two components in the event of a fire.

[0024] It will be seen that the system according to the invention provides a construction which is highly resistant to fire and thus affords a safe environment. Tests have indicated the integrity of the system at temperatures slightly below 1000°C.

[0025] The invention is not restricted to the above-described embodiment but variations and modifications may be made without departing from the scope of the invention. For example, although the embodiment shown in the drawings has only six glazing panels, more or less panels can be used with the system according to the invention. Moreover, the beams need not extend in a horizontal direction but may be extend in a vertical or other direction parallel to the plane of the glass.

[0026] It is to be understood that the relative movement permitted between the linking rod and the fittings may be provided by means other than a sliding fitting. For example there may be a linkage connection between the fittings and the rod (or other linking member) that permits relative movement such as, for example, a scissor link connection.

Claims

1. A glazing structure comprising a plurality of glass panels, at least one fitting fastened to each glass panel adjacent to an edge thereof and a linking member interconnecting adjacent fittings and therefore adjacent glass panels, wherein the linking member is connected to at least one of the fittings via a fusible member that is made of a material with a predetermined fusing point such that in the event of a fire the fusible member fuses and permits relative movement between the linking member and the respective fitting.

2. A glazing structure according to claim 1, wherein the relative movement is in a direction substantially parallel to the plane of the glass panels.

3. A glazing structure according to claim 1 or 2, wherein the linking member is slidably connected to the fitting.

4. A glazing structure according to claim 1, 2, or 3, wherein the fusible member is a plug.

5. A glazing structure according to claim 4, wherein the plug is held in place by a fixing.

6. A glazing structure according to claim 5, wherein the fixing is a grub screw.

7. A glazing structure according to any preceding claim, wherein the (or each) fitting has a bore, the fusible member is in the form of a sleeve that lines said bore and the linking member is received in said sleeve.

8. A glazing structure according to claim 7, wherein the linking member is in the form of a rod.

9. A glazing structure according to any preceding claim, wherein the linking member is connected to a beam that extends across the glass panels and is connected to a support structure.

10. A glazing structure according to claim 9, wherein the support structure is a supporting frame that surrounds said glass panels.

11. A glazing structure according to claim 10, wherein the frame has a substantially U-shaped. cross-section, the edges of the panels being received between the limbs of the U.

12. A glazing structure according to claim 10 or 11, wherein a web or base of the frame is provided with an in-fill block of resilient or flexible material.

13. A glazing structure according to claim 10, 11 or 12, wherein the, or each, beam is shorter than the distance between vertical sides of the frame.

14. A glazing structure according to any one of claims 9 to 13, wherein the beam prevents lateral flexure of the glass panels.

15. A glazing structure according to any one of claims 9 to 14, wherein there is provided a second beam that extends behind a first beam and is connected thereto.

16. A glazing structure according to any one of claims 9 to 15, wherein the linking members are secured to a support arm mounted on the beam.

17. A glazing structure according to any one of claims 9 to 16, wherein the, or each, beam is supported intermediate its (their) ends by cables.

18. A glazing structure according to any one of claim 17, wherein the cables are each pivotally connected at a first end to a structure in which the glass panels are located and at a second end to a support arm of one of the fittings.

19. A glazing structure according to claim 17 or 18, wherein there are first and second cables pivotally connected respectively to first and second support arms, the first and second support arms being interconnected by a bracing bar.

20. A glazing structure according to any one of claims 9 to 19, wherein the ends of the, or each, beam are slidably mounted on spigots secured to a structure in which the glass panels are located.

21. A glazing structure according to claim 20, wherein the ends of the, or each, beam have slots that receive a respective clamping screw such that the slot is able to slide over the screw.

22. A glazing structure according to any preceding claim, wherein a fitting is provided at each corner where four glass panels meet, each fitting being connected to adjacent fittings in both vertical and horizontal directions.

23. A structure for supporting a plurality of glass panels comprising a beam for extending across the glass panels, at least one fitting fastened to each glass panel adjacent to an edge thereof and a linking member connected to adjacent fittings and to the beam, wherein the linking member is connected to the fittings such that relative movement can take place between the beam and the fittings and hence between the beam and the glass panels, the movement being in a direction that is substantially parallel to the plane of the glass panels.

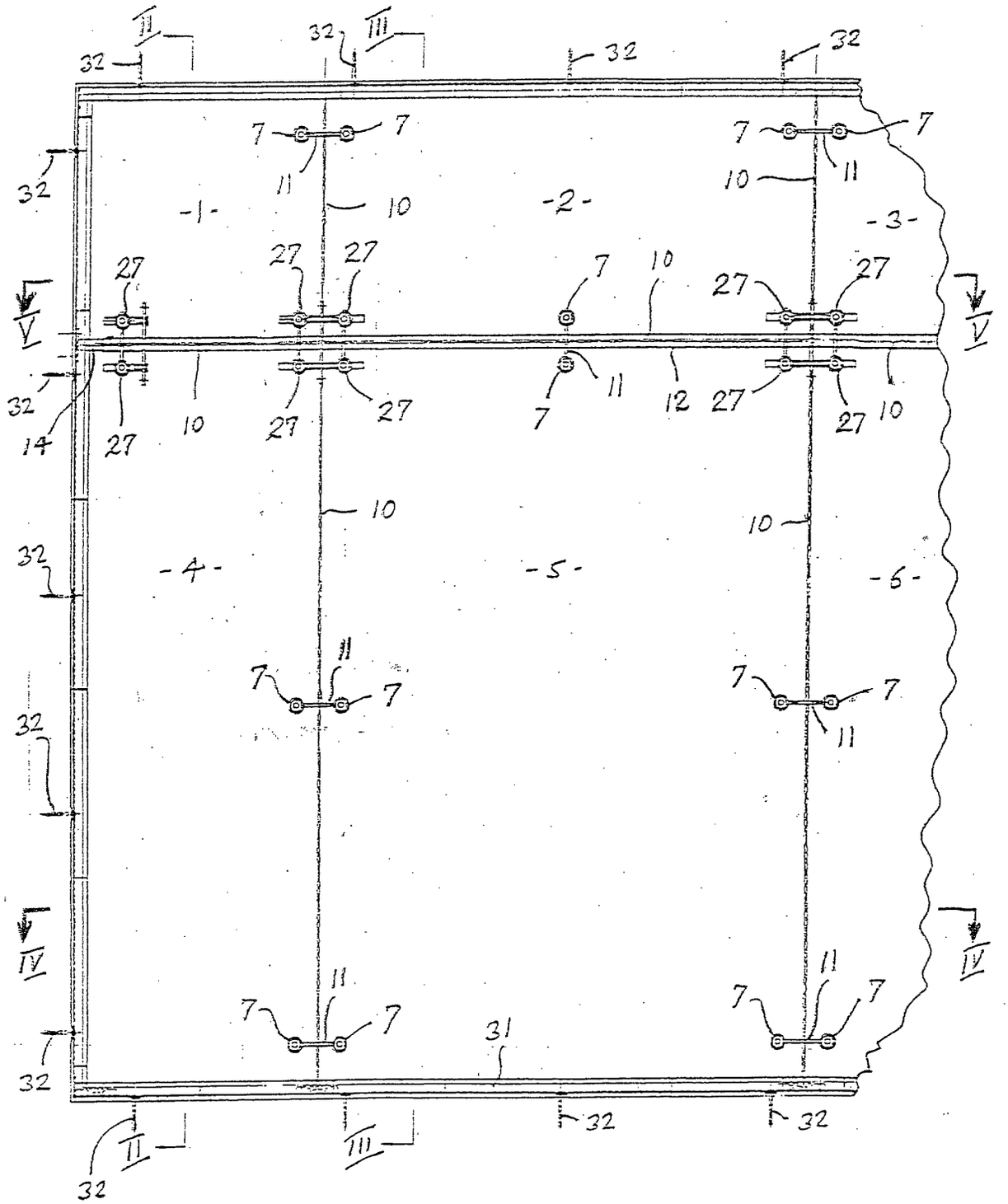

Fig. 1

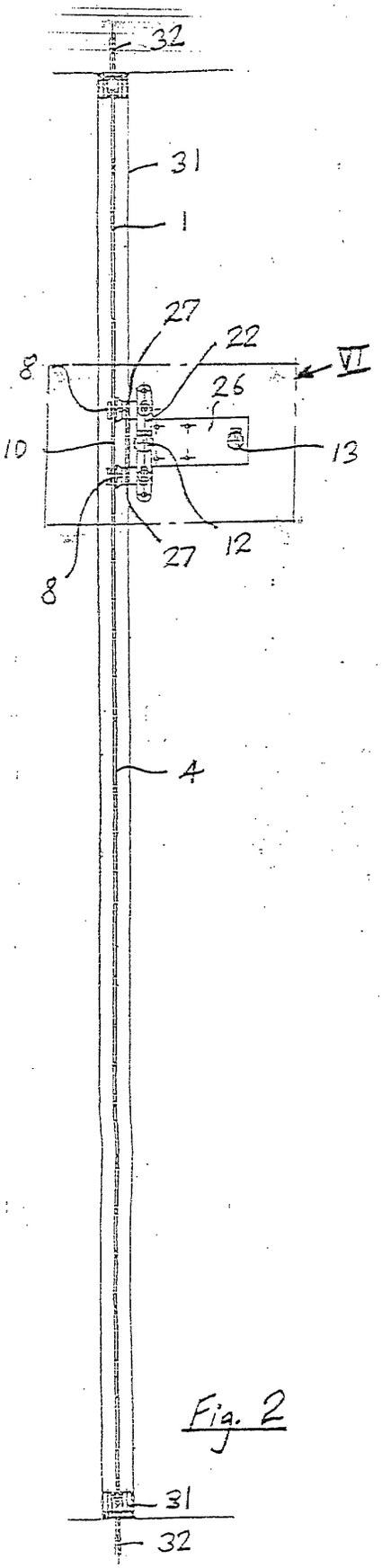
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Fig. 2

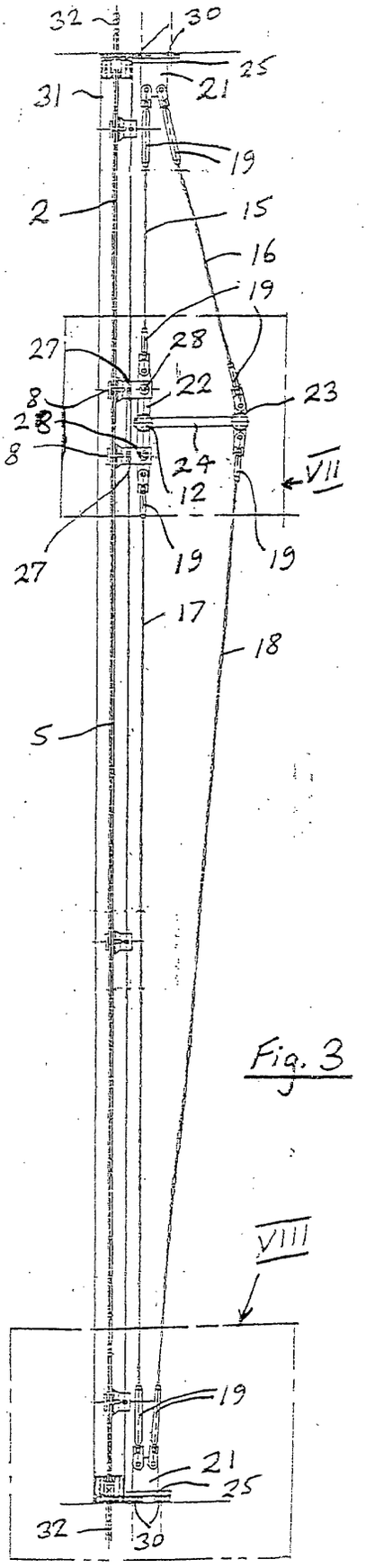
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Fig. 3

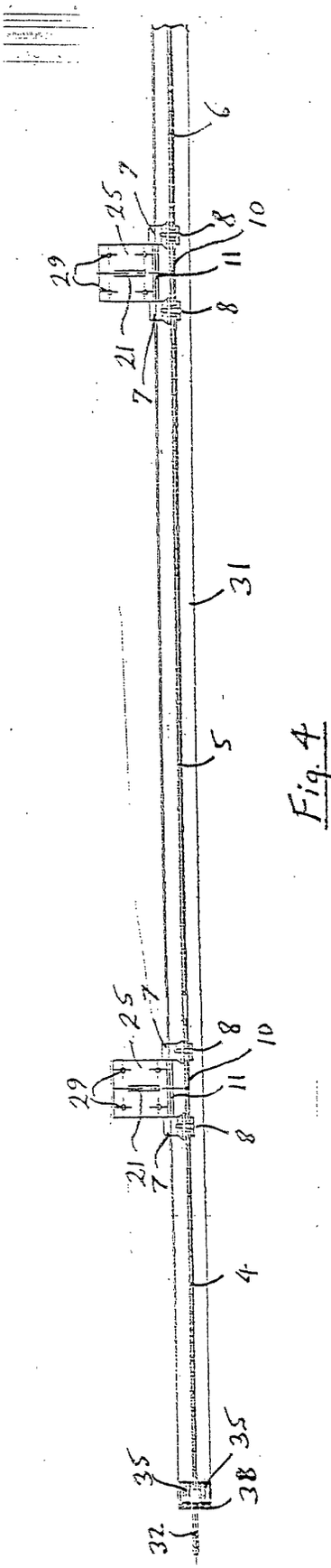
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Fig. 4

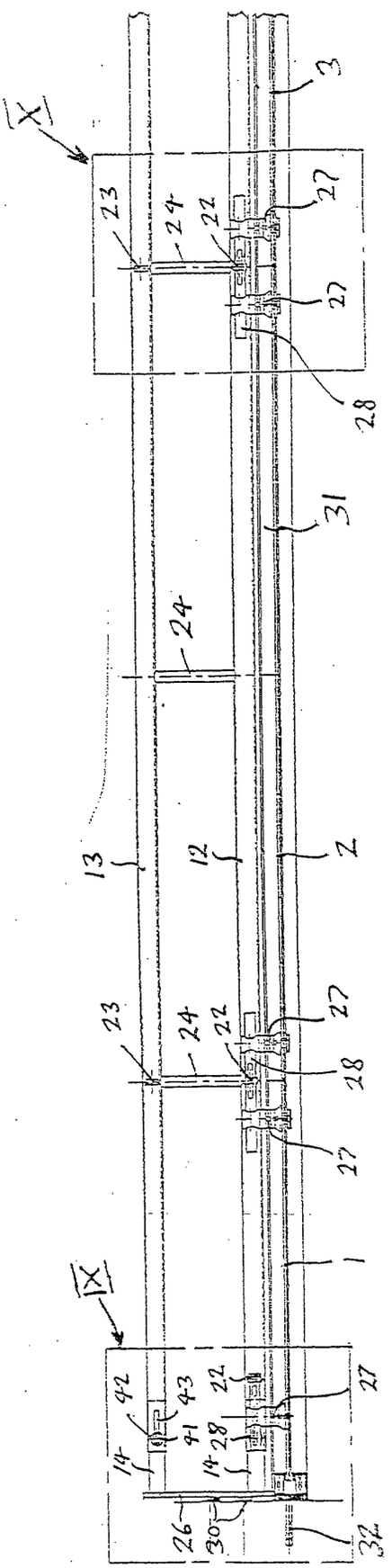
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Fig. 5

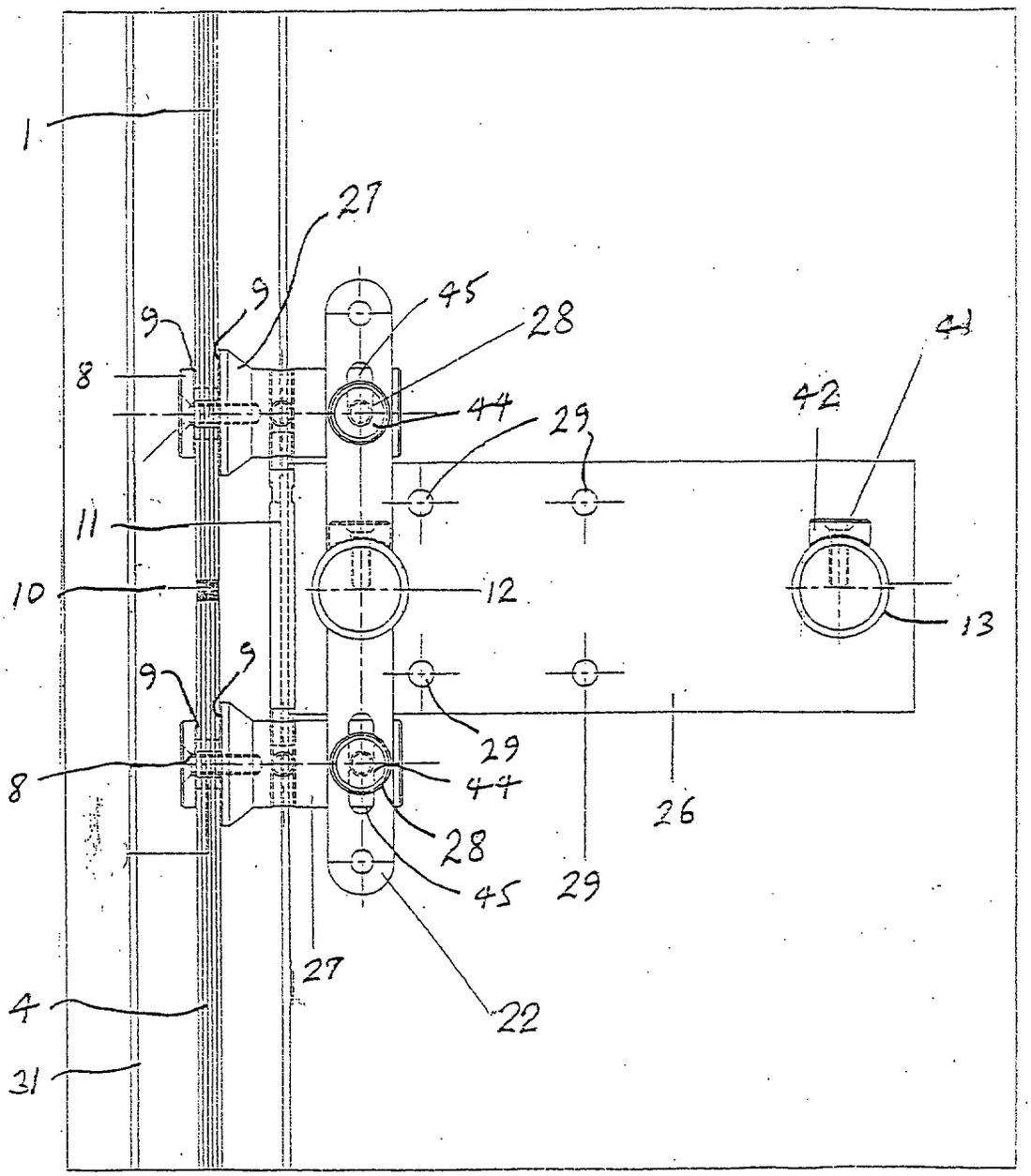

Fig. 6

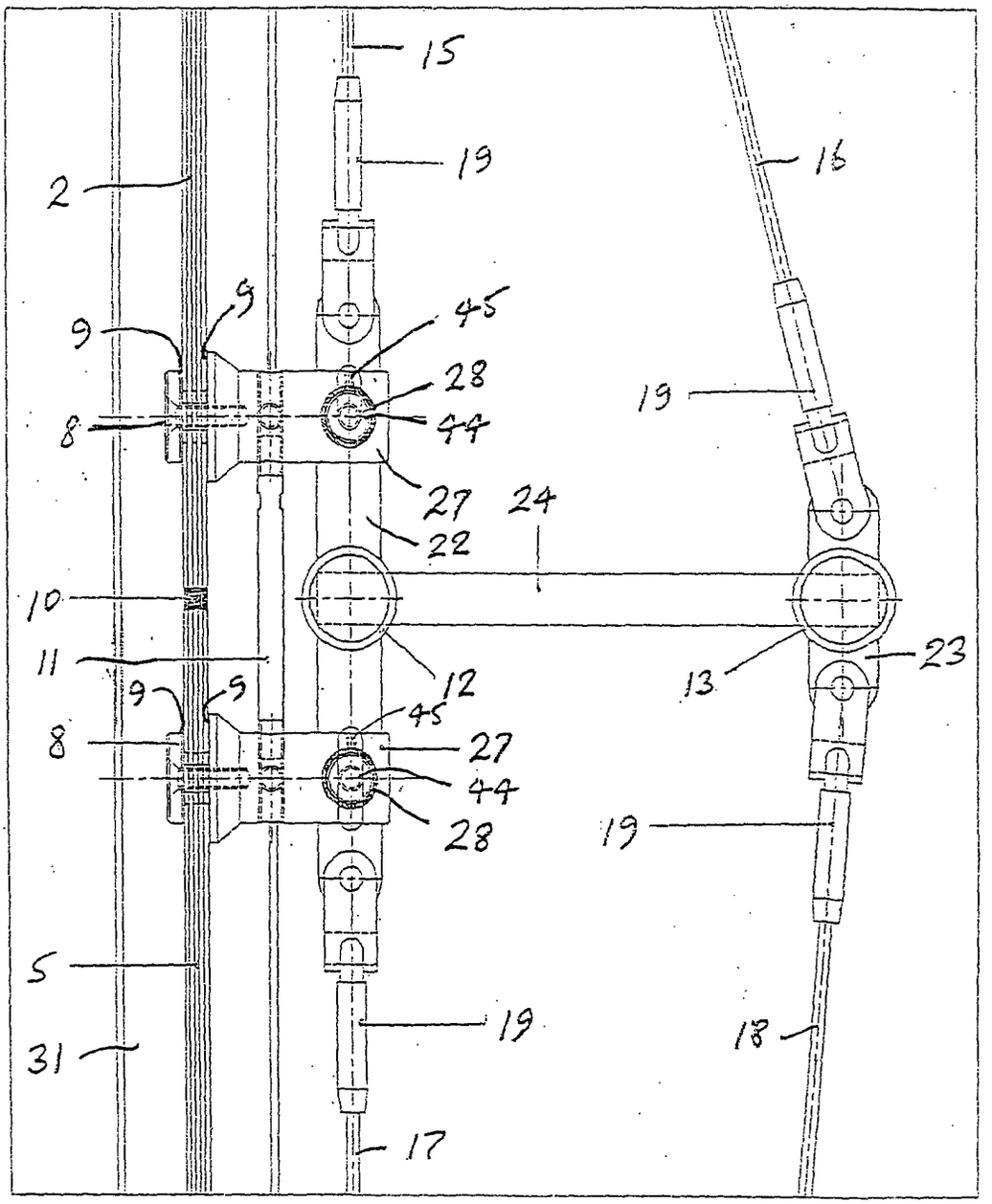
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Fig. 7

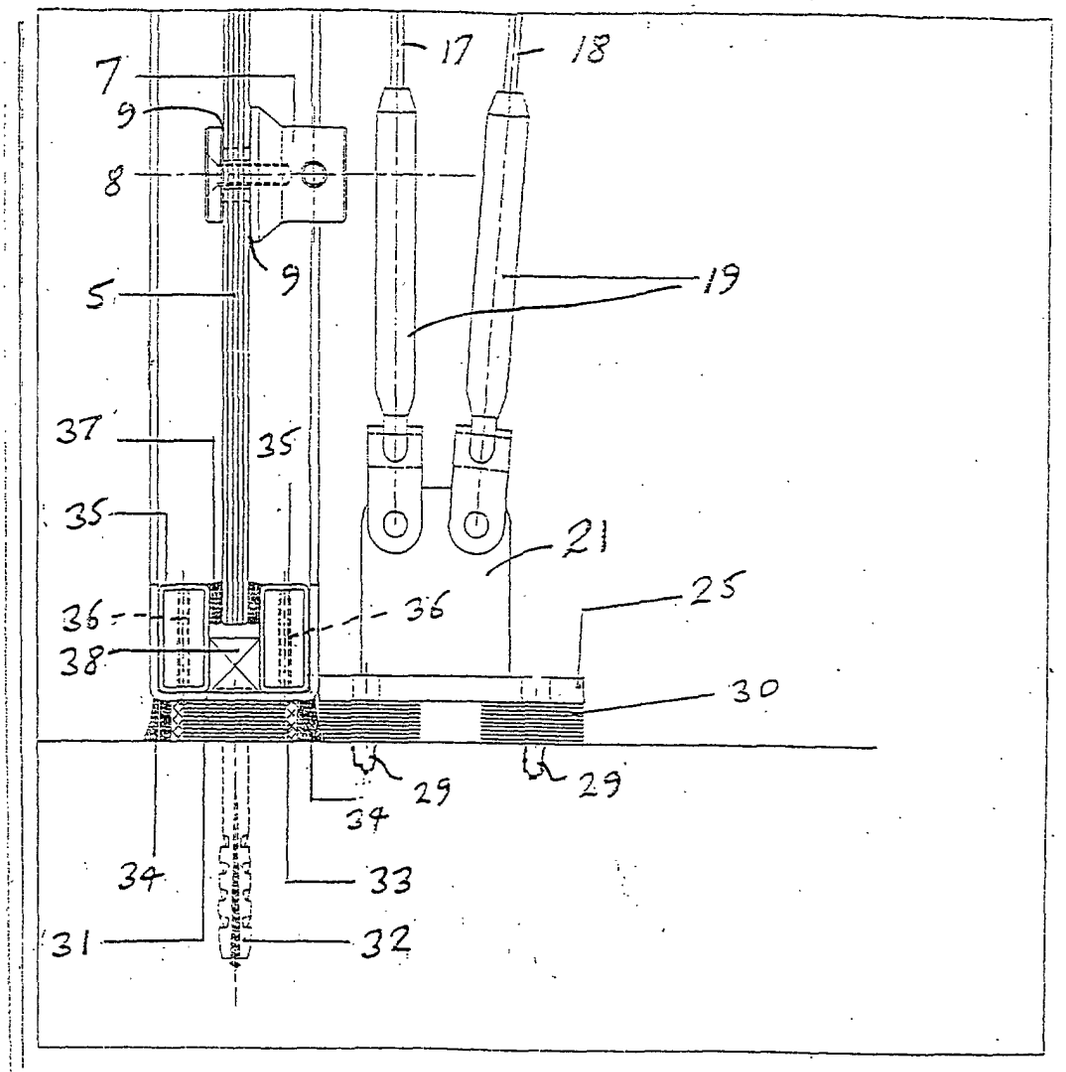

Fig. 8

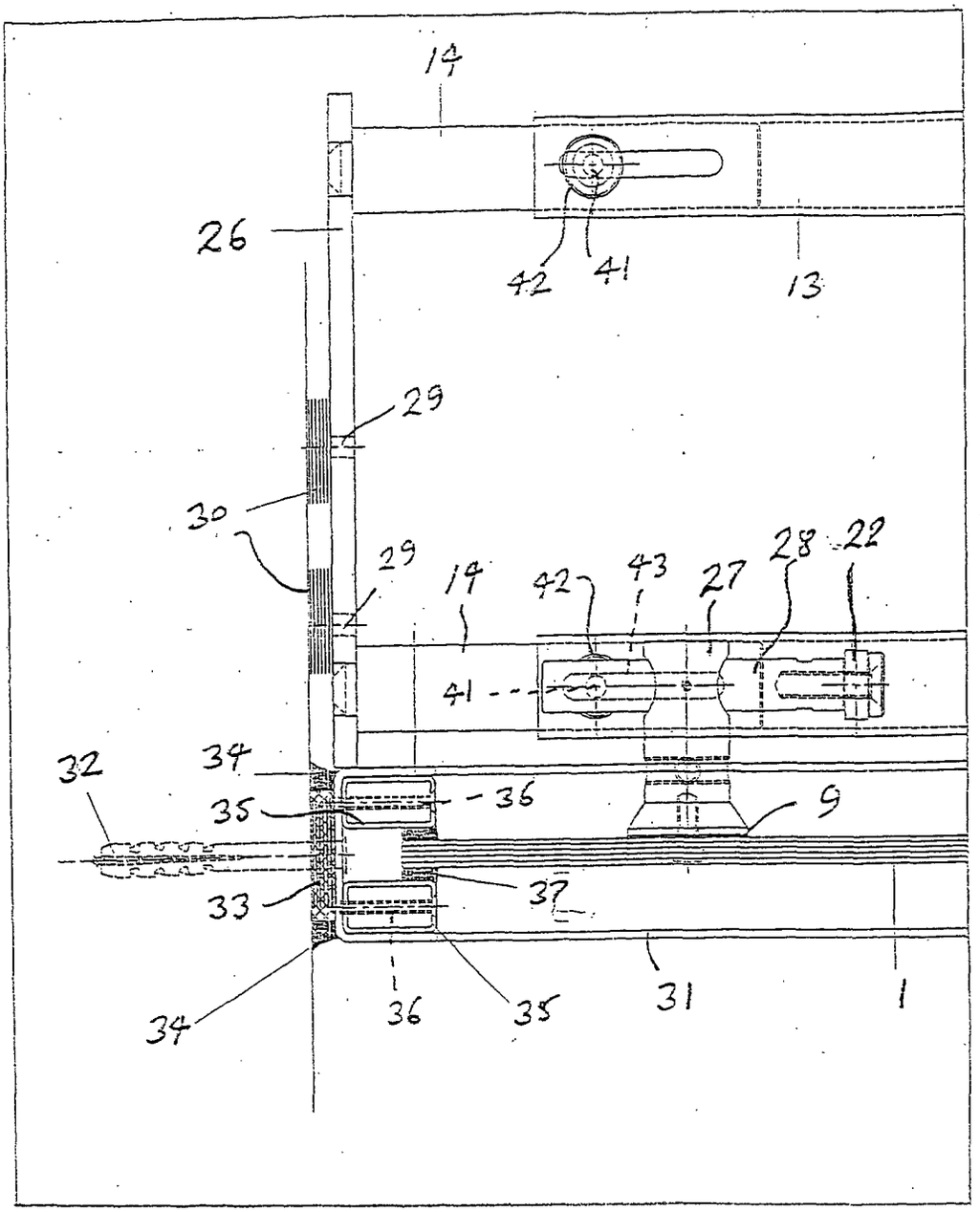
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Fig. 9

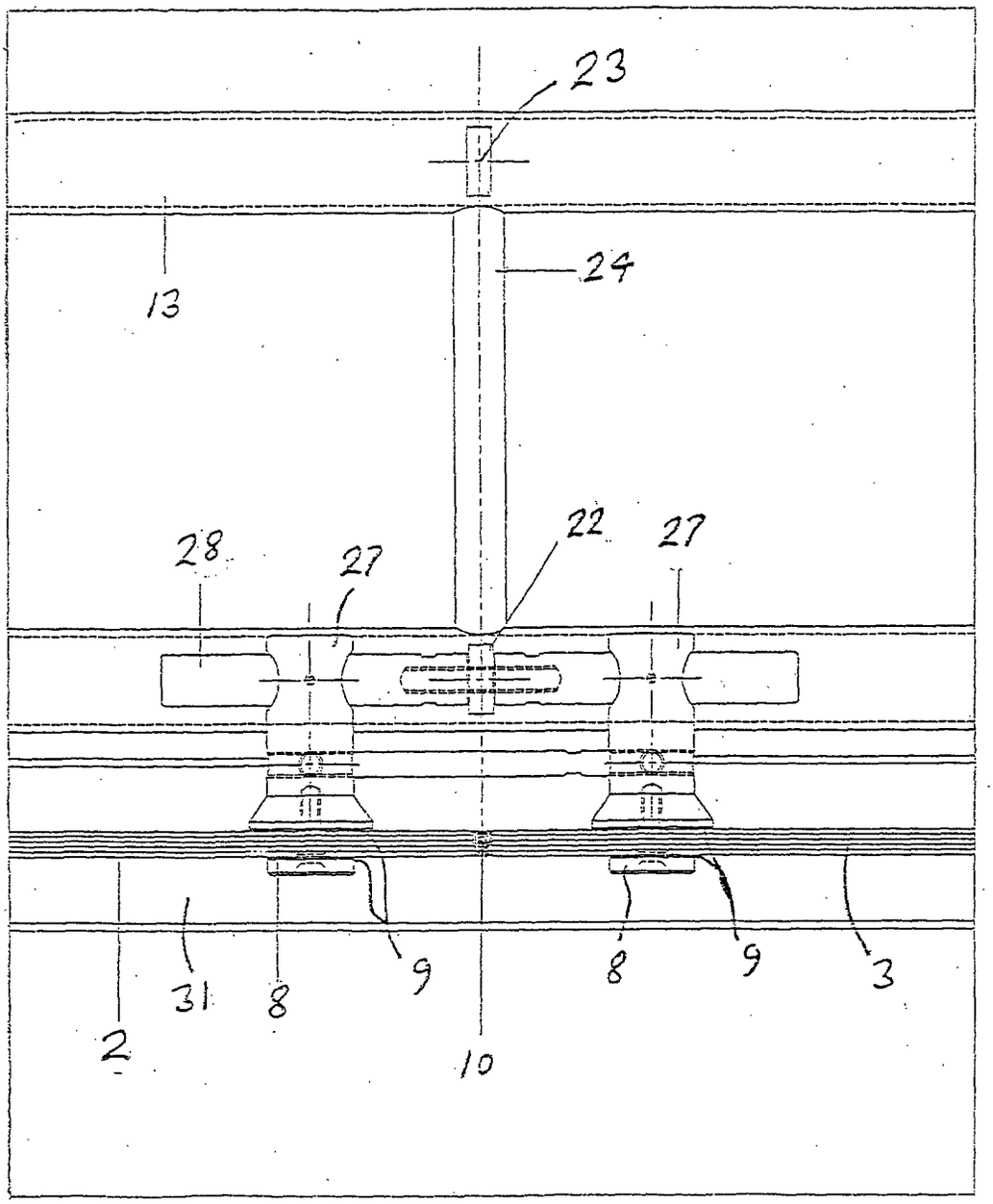


Fig. 10

FIG. 11a

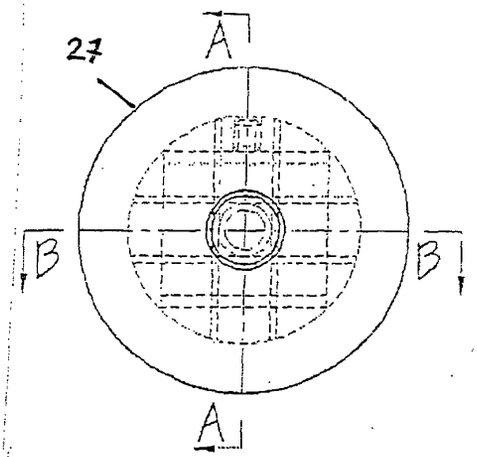
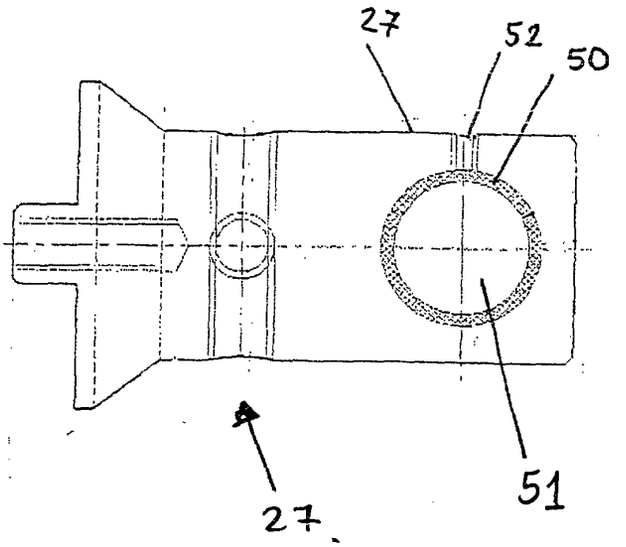


FIG. 11b



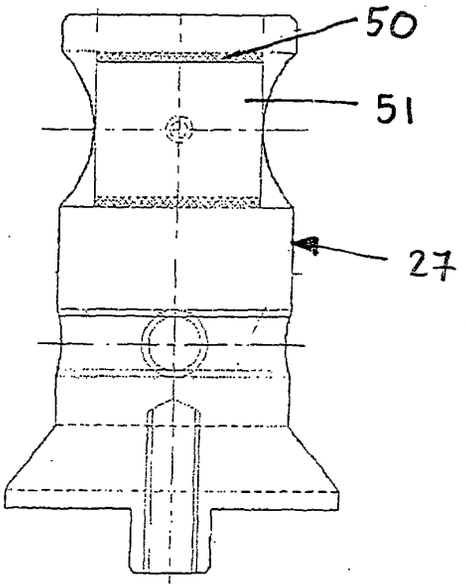


FIG. 11c