Nov. 10, 1970 R. LAVALLEY ET AL 3,538,658

FIREPROOF PARTITION FRAMEWORK

Filed Dec. 11, 1968 3 Sheets-Sheet 1

Fig: 1.

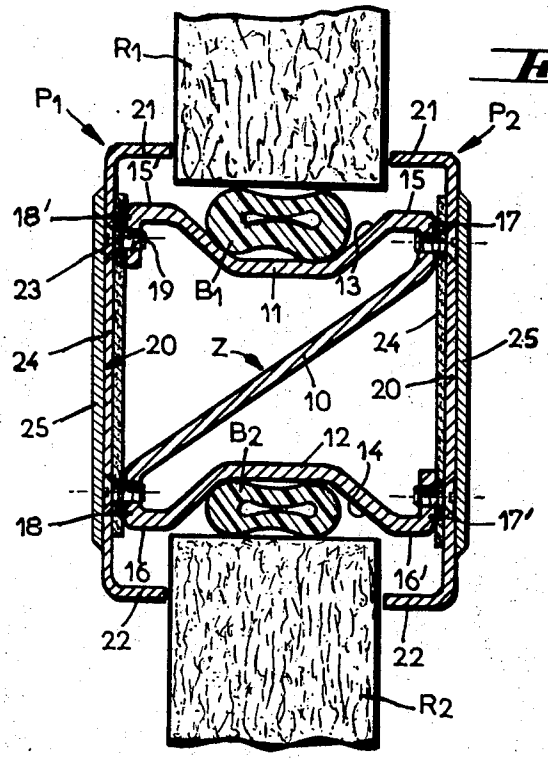


Fig: 2.

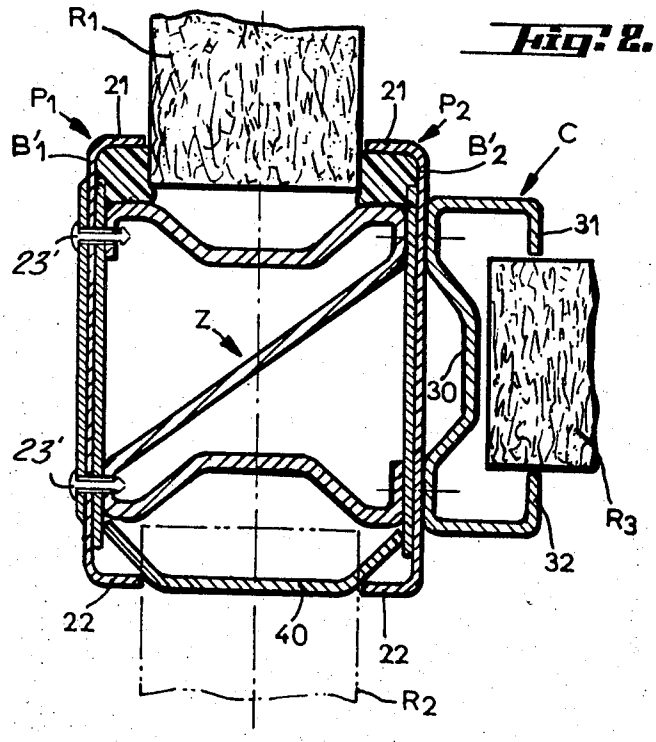


Fig. 3.

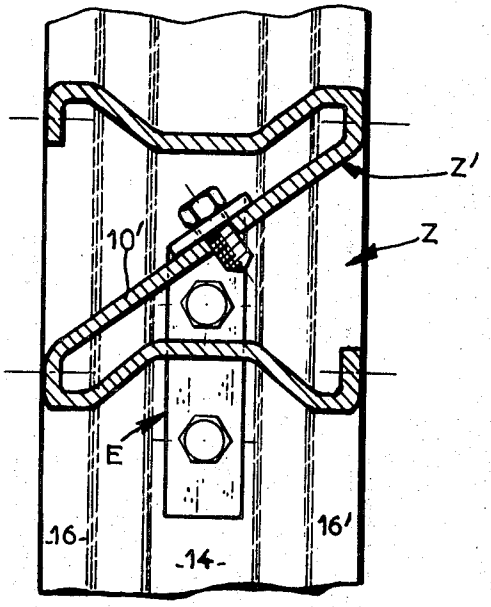
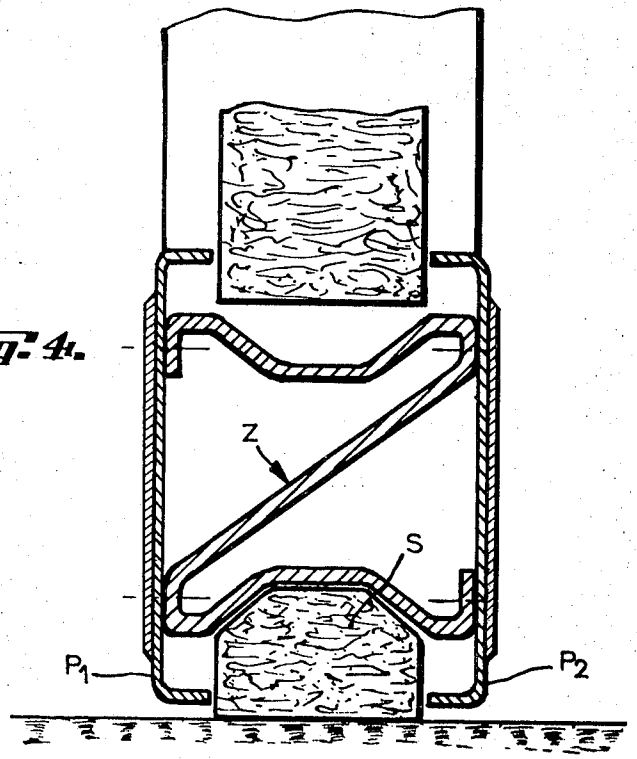


Fig. 4.



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FIREPROOF PARTITION FRAMEWORK

Filed Dec. 11, 1968 3 Sheets-Sheet 3

Fig: 5.

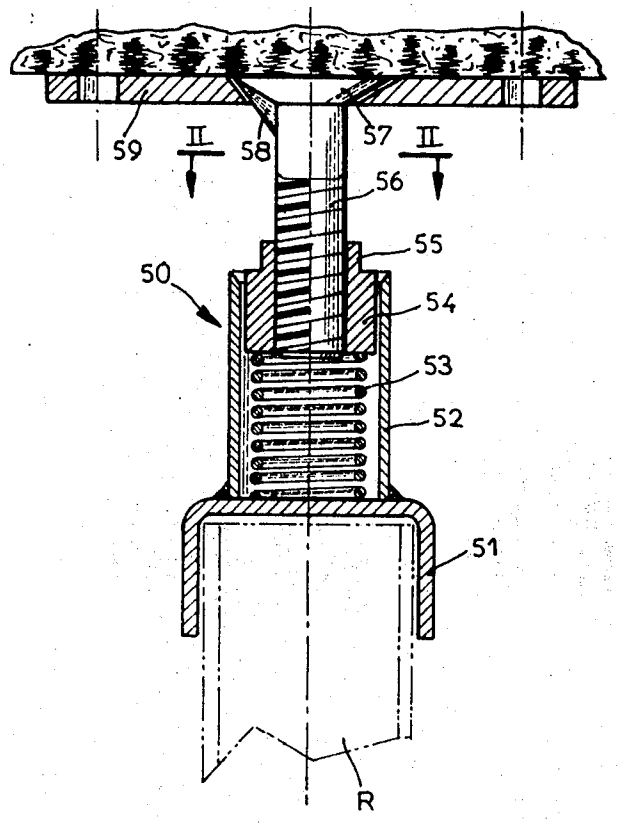


Fig: 8.

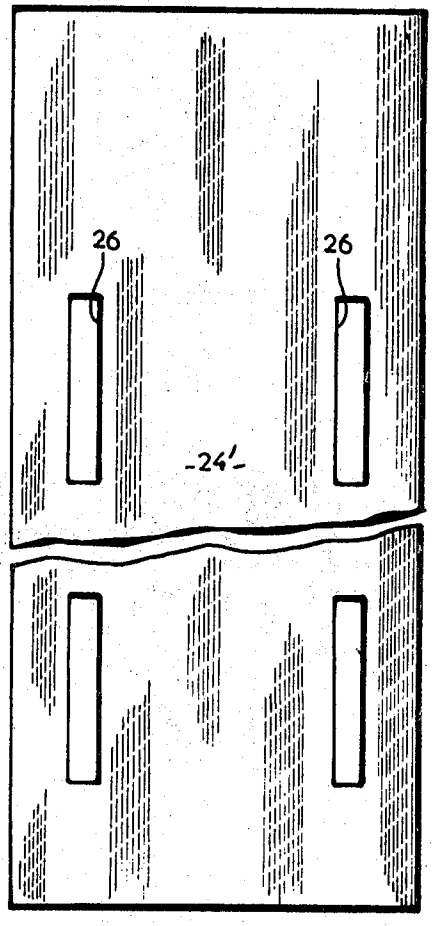


Fig: 6.

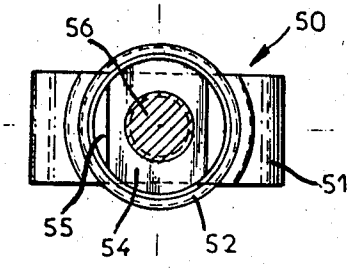
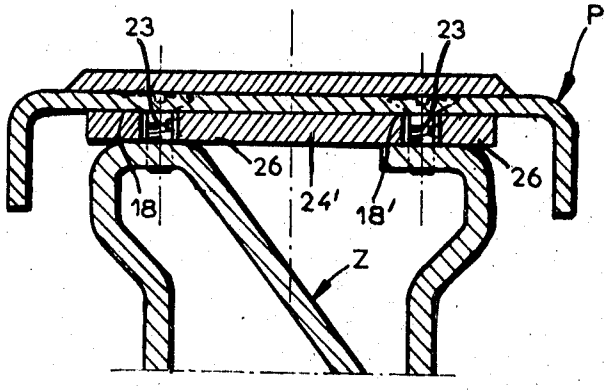


Fig: 7.



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3,538,658

FIREPROOF PARTITION FRAMEWORK

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Claims priority, application France, Dec. 13, 1967, 132,152
Int. Cl. E04b 1/62, 2/62; E04c 3/22
U.S. Cl. 52—232 20 Claims

ABSTRACT OF THE DISCLOSURE

A framework, the elements of which consist of a Z-shaped sectional member each side of which exhibits along its edges, two longitudinal spaced portions having a total width at least equal to the third of that of said sectional member, and a pair of covering frames fastened by screws or bolts onto two opposite faces of said Z-shaped sectional member with the interposition of a strip of insulating material and the flanges of which hold filling panels by clamping same.

The present invention relates to the building of partition constructions or assemblies comprising uprights, posts or standards, cross-members or beams and other like framework elements for holding, bearing or supporting panels and other filling structures and is more particularly concerned with a new framework for a fireproof or fire-guard type partition meeting or complying with regulation standards for making buildings of great height.

Although it is relatively easy to impart to filling panels or boards outstanding insulating properties, it is on the contrary difficult to avoid that their framework, consisting necessarily of stiff and mostly metallic elements, forms a thermal and acoustical shunt locally producing weakened lines in the insulation.

The object of the invention is therefore the provision of a framework in particular for fireproof partitions the elements of which exhibit built-in insulating characteristics similar to those of filling panels or boards thereby allowing to provide partitions adapted to efficiently operate, act or perform their function as fire-arresters for at least one hour in case of outbreak of a fire within a room having a thermal load of 9 B.t.u./sq. ft., the temperature differential between both sides of the partition being about 400° C.

According to an essential feature of the invention, the framework elements of said partition consist essentially of a sectional member with a generally Z-shaped cross-section inscribed within a rectangle and preferably a square, each side of which is formed adjacent to its edges with two outer longitudinal portions, and of cushion or covering frames fastened on two opposite sides of said sectional member, preferably together with an interposed strip of insulating material.

According to further characterizing features of the invention, the thickness of the Z-shaped cross-section of said sectional member is substantially constant and the sides of said sectional member corresponding to the parallel flanges or legs of its cross-sectional contour are formed with a central recess separating both aforesaid portions.

Both aforesaid portions of each side of said Z-shaped sectional member are preferably of a total width substantially equal to the third of that of said side.

Said cushion or covering frames are preferably connected to those sides of the Z-shaped sectional member

which extend at right angles to the parallel legs or flanges of its cross-sectional contour.

It is immediately apparent that a partition framework according to the invention exhibits a very low transverse thermal conductivity in view of the particular configuration of the sectional member used, of the small contacting area between the cushion or covering frames and said sectional member, of the preferred relative arrangement of these latter, and lastly of the possible interposition of an insulating material; moreover a framework element according to the invention comprises inner longitudinal ducts or channels separated from each other by the legs or flanges of the sectional member, said ducts or channels forming on the one hand air-cushions or spaces promoting acoustical as well as heat insulation and capable on the other hand in case of outbreak of fire to act as ventilating shafts, air-chimneys or stacks or flues inside the framework so as to reduce the danger of formation of hot spots. Furthermore, a framework element according to the invention exhibits an outstanding mechanical strength, stiffness or rigidity since it may be considered as a tube or pipe of rectangular cross-section braced by a diagonal partition. Finally the ease of access to the abovementioned ducts, channels or conduits by mere removal of a cushion or covering frame allows to use them for running electrical and telephone lines and other conduits therein, the checking or inspection and maintenance of which do not give rise to any problem of accessibility.

According to further characterizing features of the invention, said covering or cushion frames consist of a sectional member having a substantially flat web of a width at least equal to that of the sides of said Z-shaped sectional member and the raised edges or flanges of which are shaped to enable the anchoring, clamping or fitting in of said panels or boards, said covering or cushion frames being desirably secured on said sectional member by means of screws, bolts or the like and possibly by means of resilient clips.

It is therefore apparent that the framework according to the invention is of a very low cost, taking into account that the manufacture of the sectional member and covering or cushion frames may be carried out by simple folding of sheet strips or through an extrusion process and that their assembly or mounting may be easily effected by unskilled labour or workmanship without any particular qualification, provided with rough tools.

The framework according to the invention may of course comprise various accessory elements enabling for example the assembly or mounting of the uprights or standards and cross-members, the mounting of the transverse filling panels or boards and of bearing plates for engaging the ground or floor or the ceiling, as well as additional elements such as sealing strips or tightening packings or facing, covering or lining sectional members.

According to still another feature of the invention, said partition bears upon the ground or floor, against the ceiling or any other adjacent rigid structure through the medium of resilient stop-means preventing any displacement of said partition out of its plane and the resilient action of which is removed or at least materially reduced above a determined temperature.

Thus in case of an abnormal elevation or rise of the temperature, resulting for example from the outbreak of a fire, the partition remains retained or held in place but is free to expand within its own plane, so that no significant stress or strain is exerted upon the filling panels or boards of the partition, the breaking and/or unsetting or loosening of which through buckling or bulging are thus avoided; in this manner the fireproof partition retains all its efficiency. Moreover and as well known, the resilient

mounting of the partition improves its acoustical insulation properties under the normal conditions.

Said resilient stop-means comprise a member the mechanical properties and/or the shape of which are substantially changed above said temperature, said member consisting either of a spring or other element losing its elastic properties above said temperature or by a force transmitting element losing its rigidity or stiffness above this temperature or, lastly by a locking element vanishing above this same temperature.

Desirably said resilient stop-means allow to adjust the bearing or support of said partition.

According to a preferred form of embodiment, said resilient stop-means comprise a nut screw-threaded on a threaded rod and slidably mounted within a guide piece on which it is directly or indirectly bearing through the medium of a spring or other resilient element.

Taking into account the preceding arrangements, it is immediately apparent that in this embodiment, said member may consist for example either of the spring made for this purpose from a steel having suitable characteristics or of the nut made to this end for example from a synthetic resin or still of a stop-element interposed between the spring and the nut or the guide piece, said element being capable of creeping or flowing, of breaking or vanishing above said temperature.

According to still another characterizing feature of the invention, consequential to the preceding arrangement, the strips of insulating material interposed between the sectional member and the covering or cushion frames of each aforesaid framework element are provided with longitudinal button-holes or stud holes through which extend the screws, bolts, clips and other fastening members for securing said covering or cushion frames onto said sectional member.

Further characteristics and advantages of the invention will appear more clearly when reading the following detailed description of an exemplary non limiting embodiment illustrated by the accompanying drawings wherein:

FIGS. 1 and 2 show in susbtantially horizontal cross-section, a running standard or upright and an angle or corner upright or post, respectively, of a partition framework according to the invention;

FIG. 3 shows the assembly of an upright with a cross-member;

FIG. 4 shows the mounting of a base plate for bearing on the ground or floor;

FIG. 5 illustrates an axial section through a resilient stop means according to the present invention;

FIG. 6 is a cross-sectional view of the stop means taken upon the line V—V of FIG. 5;

FIG. 7 is a partial cross-sectional view of a partition framework element; and

FIG. 8 is a front view of a strip of insulating material incorporated in the framework element of FIG. 3.

The upright, standard or post shown in horizontal cross-section on FIG. 1 consists essentially of the assembly of a sectional member with a pair of metal cushion or cover frames generally designated by Z and P1, P2, respectively, effective to hold or retain a pair of filling panels or boards R1, R2 made from insulating incombustible material.

The sectional member Z the cross-section of which is of general Z-like shape and inscribed within a square, comprises a diagonal web **10** and a pair of parallel flanges **11, 12**; the central potrion of each one of the parallel flanges **11, 12** is depressed or recessed so as to form on its outer face a longitudinal depression or hollow **13, 14** separating a portion **15, 16** provided at the root of said flange from a portion **15', 16'** near its free end; thus, the sides of the sectional member Z corresponding to its parallel flanges **11, 12** exhibit each one a pair of spaced portions **15, 15'** and **16, 16'** located along its edges and preferably within a same plane perpendicular to the central plane of said flange. Similarly, the two other sides or faces of the sectional member Z exhibit portions **17, 17'** and **18, 18'** arranged likewise, the portions **17** and **18** consisting of flat portions provided at the junction or connection of the central web **10** with the flanges **11, 12** of the sectional member, whereas the portions **18', 17'** consist of the free raised or creased edges of said flanges, respectively. Both portions **15–15', 16–16', 17–17'** and **18–18'** of a same side of the sectional member have a total width at most equal to one third of that of the concerned side of the sectional member; desirably both portions of the four sides or faces of the sectional member are of the same width and equally spaced, in order that said sectional member may be used indifferently in one or in the other of its two possible transverse orientations, that shown in the drawings being however preferred for reasons explained hereinafter; consequently all these portions or at least the portions **17–17'** and **18–18'** are formed with like holes **19** of the same relative distribution, so as to facilitate the fastening of the covering frames P1 and P2.

The covering frames P1, P2 are identical with each other and consist each one of a metallic shape the flat web **20** of which, of a width greater than that of the sides or faces of the sectional member Z, is bounded by inturned flanges **21, 22** of a height substantially equal to half of the difference between the width of the sides or faces of said sectional member and the thickness of the filling panels or boards R1, R2; in the form of embodiment shown, the thickness of the panels being less than the width of the sectional member, the covering frames are secured to two opposite faces or sides of the sectional member Z, so that their flanges **21, 22** are in oppositely confronting or registering relationship. The fastening of the covering frames P1, P2 onto the sectional member Z may be effected by bolts or clips (**23'** in FIG. 2) extending through the holes **19**, but is carried out preferably as shown by screws **23** engaging the holes **19** previously tapped if need be and the bevel or countersunk head of which is sunk into the thickness of the web **20** of the covering frame. In order to reduce the thermal conductivity of the assembly, a strip **24** of incombustible insulating material, for example made from an asbestos fabric or felt is interposed between each covering frame P1, P2 and the appropriate face or side of the sectional member Z. Moreover a screw concealing or hiding plate **25** or other facing means of any nature may be affixed as by gluing or sticking onto the exposed face of each one of the covering frames.

The manner of fastening the covering frames which have just been described offers the advantages on the one hand to enable their easy mounting or removal without impairing the behaviour or strength of the assembly, in particular in case of fire, and on the other hand to enable the holding or retaining of the filling panels by positive clamping upon taking advantage of the relative compressibility of the insulating strip **20** which also makes allowance for the unavoidable irregularities or variations of the thickness of the panels or of the transverse dimensions of framework elements. In this latter respect, it should be noted that the arrangement of the sectional member Z shown enables to exert a substantial clamping or tightening force upon the filling panels without said sectional member being likely to be deformed.

This arrangement also offers the advantage of limiting the possible displacements of the panels R1, R2 in their own plane by positive abutment of their edge against the flanges **11, 12** of the sectional member Z and of enabling the insertion between said flanges and edge of said panels of packings, pads, strips or hoses B1, B2 made from plastic and/or resilient and preferably incombustible material with a view to provide a tight seal at the junction between the panels R1, R2 and/or to improve the acoustical performances or capabilities of the partition which in this case may provide an attenuation of about 30 db. Furthermore, this arrangement of the sectional member Z enables to have an easy access by simple removal of the covering frames P1, P2, to the ducts or

channels defined between the central web **10** and the flanges **11, 12** of the sectional member Z, said ducts or channels being then adapted to be used for the passage of electrical or telephone conductors and/or conduits, the mounting, checking or inspection and maintenance of which are thus devoid or free of any particular limitation or constraint. However, as much care as possible should be taken that said hoses **B1, B2**, conductors or conduits or any other filling material do not fully close the relevant duct or channel at any point thereof, in order to maintain the free circulation or flow of air along said channel or duct and thus promote or facilitate, in case of fire, the removal through convection of the heat brought to a possible hot spot.

On FIG. 2 is shown in horizontal cross-section, an angle applied or a corner post or standard holding or supporting two filling panels **R1, R2** arranged at right angles to each other. The upright or post shown comprises a sectional member Z and a pair of covering frames **P1, P2**, disposed and assembled in the manner previously described; the angle panel **R3** is retained by a sectional member C affixed onto the covering frame **P2** and in which the edge of the panel **R3** is embedded or fitted. The sectional member C, seen in cross-section, essentially comprises a web **30** which may be flat or preferably as shown, depressed or recessed so as to provide an additional ventilating channel or duct and a pair of doubly folded edges or flanges **31, 32**, between which edge of the panel **R3** is received. The sectional member C could of course be divided longitudinally in two parts secured independently onto the covering frame **P2**, for example to facilitate the positioning or mounting of the panel **R3**. If the panel **R2** is not present, a sectional member **40** is preferably inserted under the raised edges or flanges **22** of the covering frames **P1, P2** to improve the appearance of the upright as well as to protect the sectional member Z against outer agents. The panel **R3** could of course form an integral part of a projecting partition in which case the filling panel **R2** would be held or retained by the post as previously described and as shown in chain dotted lines on FIG. 2 which shows moreover a further possible arrangement of the sealing packings or strips **B'1, B'2**.

FIG. 3 illustrates an example of assembly of the sectional members Z, Z' integrated into a standard and framework cross-beam, respectively. Both of these sectional members are assembled by means of an angle bracket E one flange of which is secured by two screws or bolts onto the bottom and in registering relation to the axis of the recess or depression **14** of the sectional member Z of the upright, and the other flange of which, fastened as by screws onto the web **10'** of the sectional member Z' of the cross-beam, exhibits a lateral slope corresponding to that of the web of the sectional member. Both flanges of the angle bracket E could of course be laterally inclined to enable the fastening to the sectional member Z of a cross-member extending at right angles to that shown.

FIG. 4 shows in vertical section an illustrated embodiment of the bearing upon the ground or floor of a partition according to the invention. As shown, this bearing is provided through the medium of a base plate S held by the bottom ends of the covering frames **P1, P2** mounted on the sectional member Z of a lower cross-tie of the partition framework. The base plate S, shown as being a simple sectional cleat of insulating material, could of course exhibit a more complex structure enabling for example the adjustment of the bearing upon the ground or floor and providing a resilient bearing as described hereinafter.

FIGS. 5 and 6 illustrate a not limiting embodiment of a resilient stop means shown to be positioned between the ceiling and the top edge of the filling panel R of the partition; this stop means could of course be used for providing the bearing of the partition upon the ground or floor, as well as against a wall or upon a framing or doorcase element.

The resilient stop means **50** comprises a stirrup-like member **51** straddling the edge of the filling panel R, said stirrup-like member being made integral as by welding with a sleeve or bushing **52** the inner diameter of which, as is clearly seen on FIG. 6, is preferably larger than the width of said stirrup-like member for reasons to be given hereinafter. A spring **53** is compressed between the stirrup **51** and a cylindrical nut **54** slidably mounted within the sleeve or bushing **52**; the top end of said nut comprises for example flat sides **55** or another structure enabling to move it along the threaded shank portion of a bolt **56** the head **57** of which, formed with a feather **58**, is anchored or retained in a small plate **59** affixed to the ceiling by any suitable means.

It is readily apparent that the resilient stop means **50** which has just been described provides an efficient holding for the partition: as a matter of fact, the bolt **56**, being held against movement with respect to the ceiling, the sidewise displacement of the partition is prevented by the sliding engagement of the nut **54** with the sleeve or bushing **52**, itself integral with the stirrup **51** wherein the edge of the panel R is built in, fitted or embedded. On the other hand, the operation of the nut **54** enables to adjust at will the force exerted upon the partition by the resilient stop **50** in spite of the unavoidable irregularities of the height between ground or floor and ceiling.

According to an essential feature of the invention, the force applied to the partition by the resilient stop means **50** should vanish or at least be materially reduced when the ambient temperature in view of a fire would reach an abnormal value for example about 300 to 400° C. For this purpose, the spring **53** may be made of steel or other resilient alloy of suitable grade exhibiting a transition temperature of the order of magnitude indicated for which its modulus of elasticity is strongly reduced. In an alternative embodiment, the nut **54** could be made from a suitable synthetic resin exhibiting a pasty melting temperature of the order of magnitude indicated, so that the vanishing of the threads of the nut through creeping above said temperature enables its sliding along the bolt **56**. According to still a further alternative embodiment, the spring **53** instead of bearing upon the stirrup **51**, could for example bear upon a dog or cup hanging on the edge of the sleeve or bush **52**, said dog or said cup being capable of becoming broken or of creeping above the aforementioned temperature so as to enable the free expansion of the spring **53**.

Of course, in order that the arrangements which have just been described be efficient, it is preferable that the spring **53**, the nut **54** or the spring bearing dog or cup, depending upon the case, be directly exposed to the ambient temperature. To this end, it is sufficient to provide a free communication between the inner space of the sleeve **52** and the ambient atmosphere for example by means of holes formed in said wall or more simply and as shown on FIG. 6, by using a stirrup **51** of smaller width than the inner diameter of the sleeve **52**.

FIGS. 7 and 8 illustrate a further improvement according to the invention which, as that previously described, aims essentially at assuring the efficiency of the fire-proof partition in case of a fire. Normally, the strip of insulating material interposed between the sectional member Z of each framework element and the covering frames P secured to said sectional member for holding the filling panels R, consists of a material such as asbestos the mechanical properties and in particular the brittleness and coefficient of expansion of which are fairly different from those of the metals or alloys forming the sectional member Z and the covering frames P. Therefore, in case of a fire, it is advisable to prevent the expansion of the sectional member and covering frames from exerting upon the insulating strip excessive stresses likely to result in its rupture and hence the removal of the insulation it provides.

For this purpose as clearly seen on FIGS. 7 and 8, the insulating strip **24'** is provided with longitudinal but-

ton-holes or like elongated apertures **26** through which extend the screws **23** fastening the covering frame P onto the longitudinal portions **18**, **18'** of the relevant side or face of the sectional member Z. In this manner, the expansion of the sectional member Z of the covering frame P exerts upon the insulating strip **24'** through the medium of the screws **23** no local force likely to cause the rupture of said strip.

It should be understood that the present invention is not limited to the forms of embodiments described and shown which have been given by way of example only. In particular, it comprises all the means forming the technical equivalents of the means described as well as their combinations carried out according to the principles, gist and scope of the invention as defined in the appended claims.

What is claimed is:

1. A framework for a partition of the fire-proof type, comprising posts, cross-beams and other like elements for holding panels and other filling structures, characterized in that said framework elements consist essentially of a sectional member with a generally Z-shaped cross-section inscribed in a rectangle, each side face of which exhibits two outer longitudinal bearing portions adjacent to its edges, and of at least one pair of covering frames secured onto two opposite sides of said sectional member with the interposition of a strip of insulating material.

2. A framework according to claim **1**, characterized in that the thickness of the Z-shaped cross-section of said sectional member is substantially constant.

3. A framework according to claim **2**, characterized in that the sides of said sectional member corresponding to the parallel legs of its Z-shaped cross-section, are formed with a central recess separating both aforesaid portions.

4. A framework according to claim **3**, characterized in that both aforesaid portions of each side of said Z-shaped sectional member are of a total width no greater than one third of that said side.

5. A framework according to claim **3**, characterized in that both aforesaid portions of each side of said Z-shaped sectional member are symmetrical with respect to the central pane of said face and perpendicular to said plane.

6. A framework according to claim **1**, characterized in that said covering frames are fastened to those sides of said Z-shaped sectional member which are perpendicular to the parallel legs of its cross-section.

7. A framework according to claim **6**, characterized in that said covering frames are secured by means of resilient clips engaging holes formed in said portions.

8. A framework according to claim **6**, characterized in that said covering frames consist of a sectional member with a preferably flat web, having a width at least equal to that of the sides of said Z-shaped sectional member and the raised edges of which are shaped to enable the clamping of said panels.

9. A framework according to claim **8**, characterized in that said covering frames, having a generally U-shaped flattened cross-section, comprise raised edges having a height substantially equal to the half of the difference between the width of the faces of said Z-shaped sectional member and the thickness of said panels.

10. A framework according to claim **9**, characterized in that said raised edges are adapted to clamp between them the edges of panels which extend parallel to said covering.

11. A framework according to claim **9**, which includes a sectional member secured to a covering frame said member being adapted to receive an edge of a panel which extends at the right angles to said covering frame.

12. A framework according to claim **1**, charatcerized in that the Z-shaped sectional members forming a pair of perpendicular elements of said framework are assembled by means of an angle bracket, at least one flange of which exhibits a slope mating that of the webs of said sectional members.

13. A framework according to claim **1**, characterized in that said partition bears upon the floor, the ceiling and any other backing structure through the medium of resilient stop means preventing any displacement of said partition out of its plane and comprising a member the mechanical properties and/or the shape of which are substantially changed above a predetermined temperature.

14. A framework according to claim **13**, characterized in that said member consists of a spring adapted to lose its elastic properties above said temperature.

15. A framework according to claim **13**, characterized in that said member consists of a force-transmitting element adapted to lose its rigidity above said temperature.

16. A framework according to claim **13**, characterized in that said member consists of a retaining element adapted to vanish above temperature.

17. A framework according to claim **13**, characterized in that said resilient stop means enable the adjustment of the bearing of said partition.

18. A framework according to claim **14**, characterized in that said resilient stop means comprise a nut screw-threaded on a threaded rod and slidably mounted within a guide piece on which it bears directly or indirectly through the medium of a spring.

19. A framework according to claim **18**, characterized in that the inner space of said sleeve communicates freely with the ambient atmosphere.

20. A framework according to claim **1**, characterized in that said strips of insulating material interposed between said sectional member and said covering frames of each aforesaid framework element are provided with longitudinal elongated apertures through which extend means for fastening said covering frames onto said sectional member.

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JOHN E. MURTAGH, Primary Examiner

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