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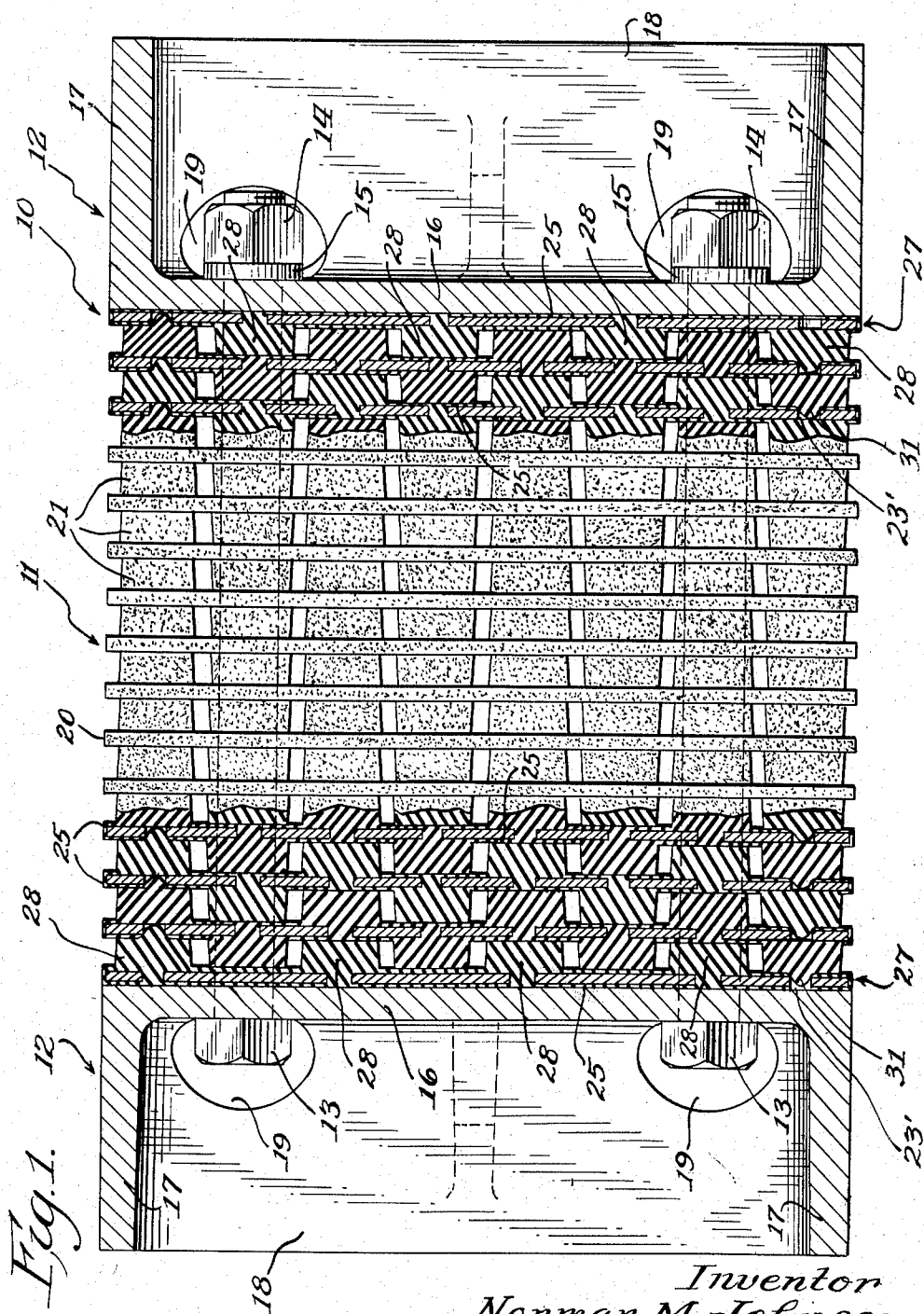
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2,907,474

RUBBER DRAFT GEAR

Filed Jan. 23, 1957

3 Sheets-Sheet 1



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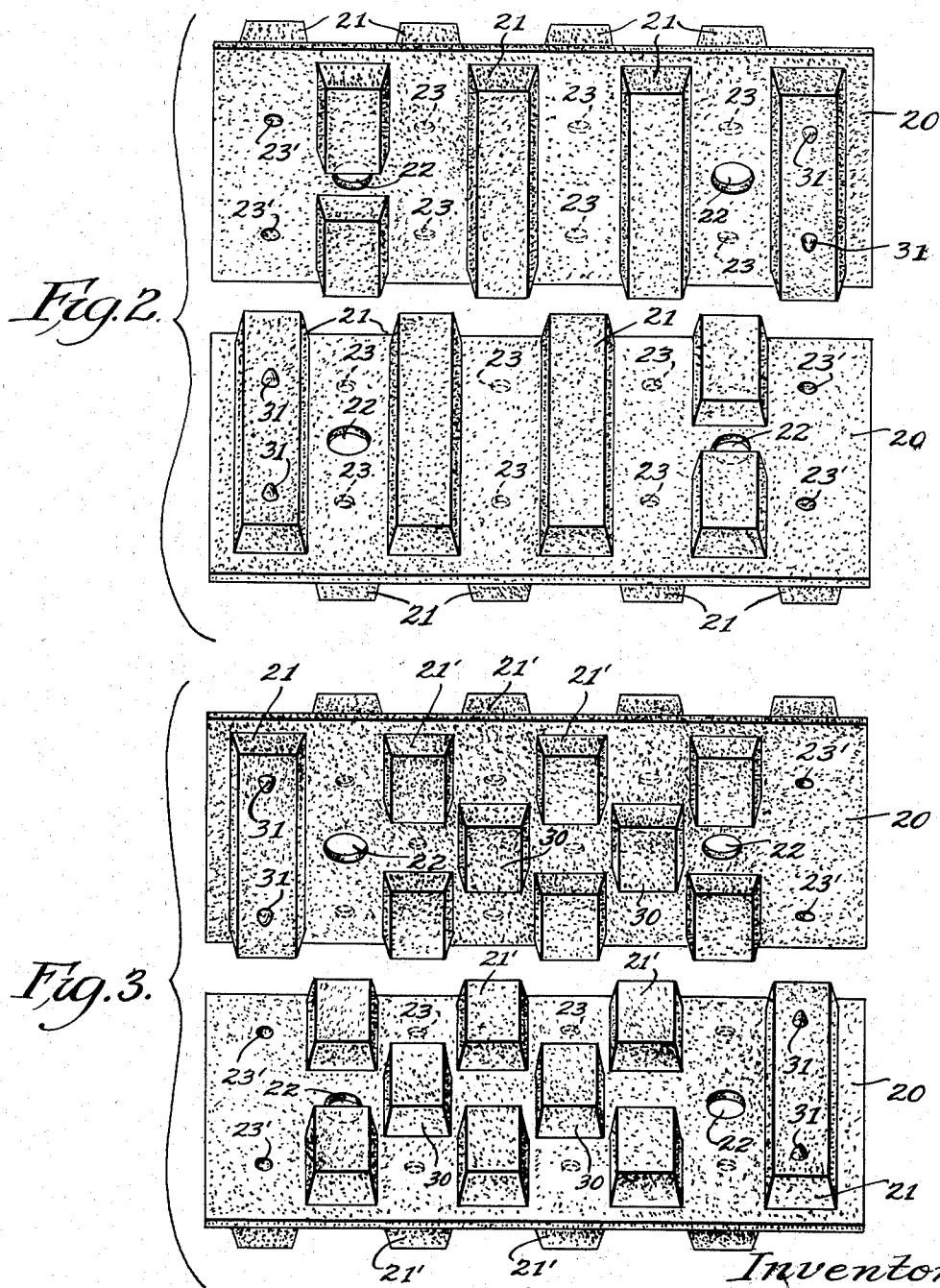
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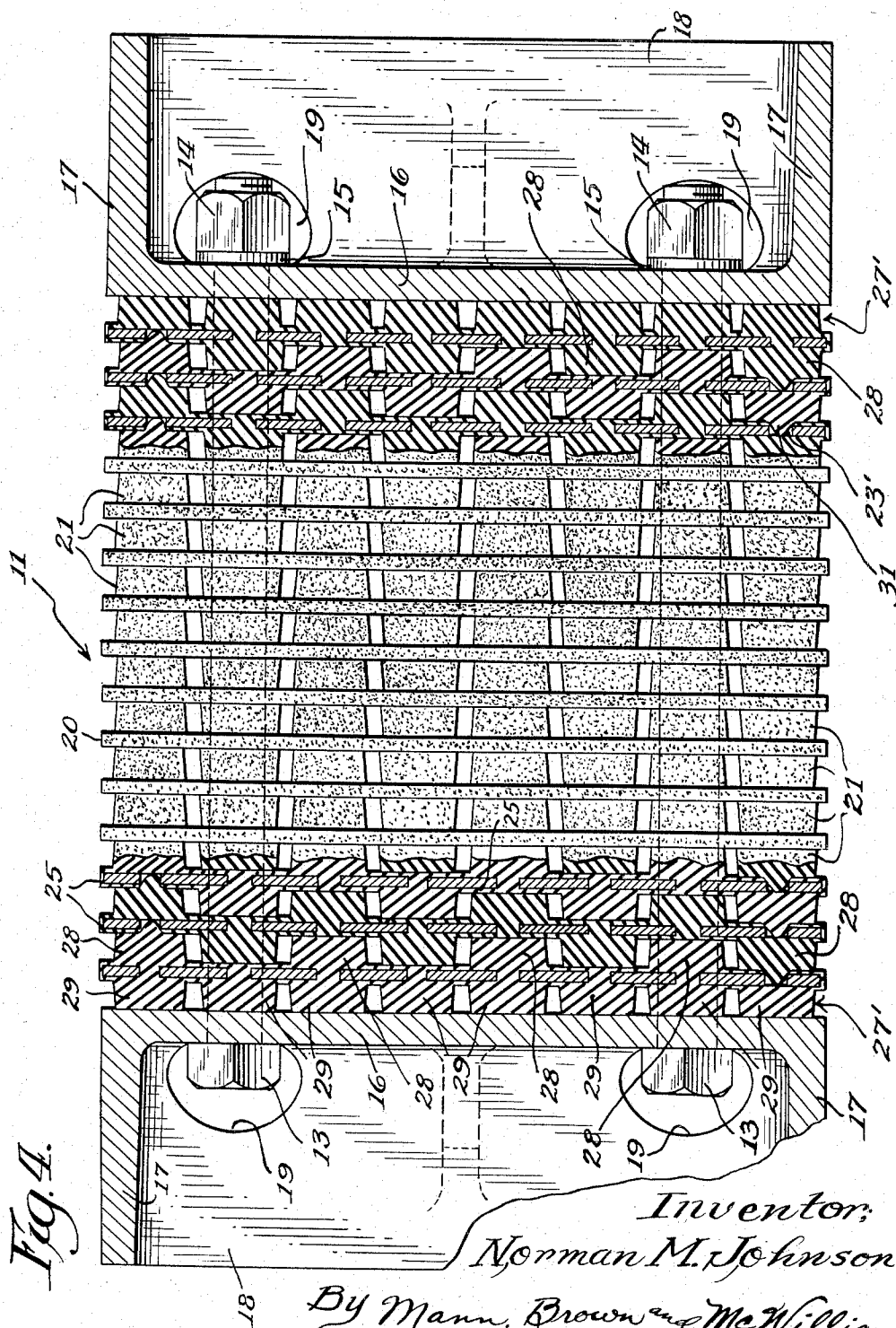
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1

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RUBBER DRAFT GEAR

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6 Claims. (Cl. 213-45)

This invention relates to rubber spring units for railway draft gears and more particularly is concerned with spring units that utilize an aligned stack of longitudinally spaced resilient mats, each mat consisting of a flat transversely extending steel mounting plate that carries a series of rubber bars on its opposite faces.

In prior art spring units of this general type, there is a tendency for the mat elements to become misaligned and in extreme cases the edges of the plates may contact the center sills and foul the operation of the gear. Such difficulties arise when the gear is subjected to severe compression forces, and are particularly harmful when the gear is struck an angular blow.

When the incident compression forces are applied angularly with respect to the longitudinal axis of alignment of the mats, the mats are subjected to concentrated loading along one side and the marginal rubber bars on this heavily loaded side are distorted to such an extent that they flow around the edge of the adjacent steel plate and exert a transverse force on the plate to develop the misalignment. While rubber gears that have tension bolts telescoped through the mats initially resist these transverse forces, there is a rapid wear of the mat plates in the region of the bolts and the resultant play ultimately leads to a dangerous misalignment of the plates.

It is the principal object of the present invention to arrange the rubber bars on adjacent transverse plates in intercalated interlocking relationship to engage in response to a predetermined compression of the gear and resist transverse forces that may arise while automatically and continuously maintaining proper mat alignment.

It is a further object to provide an arrangement wherein the rubber bars are compressed directly between adjacent steel plates and wherein the bars and plates are formed with cooperating interengaging portions that facilitate proper gear alignment during assembly of the gear and provide a guiding action during light loading of the gear.

Other objects and advantages of the invention will become apparent as the description proceeds.

In the accompanying drawings, forming a part of this specification and in which like numerals are employed to designate like parts throughout the same;

Fig. 1 is a plan view, partially in section, illustrating the construction of a rubber draft gear according to the invention;

Fig. 2 is a perspective view of a pair of adjacent spring elements or mats which are shown folded apart to better illustrate the interlocking relationship between the bars that are carried on the opposed faces of the mounting plates;

Fig. 3 is a perspective view similar to Fig. 2 illustrating an alternative bar arrangement; and

Fig. 4 is a plan view partially in section showing a modified construction for the outermost spring mats that bear directly against the end castings of the gear.

Referring now to the drawings and more particularly

2

to Fig. 1 the improved arrangement of the invention is shown embodied in a rubber draft gear, designated generally as 10, that represents an improvement on the gear shown in U. S. Patent No. 2,705,569 issued April 5, 1955, to H. E. Tucker, the disclosure of which, to the extent that it is not inconsistent herewith, is specifically incorporated by reference.

The present gear includes a rubber spring assembly, generally designated as 11, that is held between opposed end castings, designated as 12, by a pair of tension bolts 13 that telescope through the assembly and cooperate with suitable nuts 14 to compress the spring between the end castings. Lead washers 15 are provided under the nuts to shorten the gear for convenience in handling, shipping and installation and these washers yield after a few operations to allow the gear to expand appropriately.

Each end casting is a substantially hollow rectangular body having a bearing wall 16 and suitably interconnected vertical and horizontal reinforcing flanges 17 and 18 respectively. The horizontal flanges 18 are formed with access openings 19 adjacent the nut and adjacent the head of the bolt to permit of inserting a suitable spacer for shortening the gear before removing it from its mounting pocket.

The spring assembly itself includes an aligned stack of longitudinally spaced individual spring elements or mats, each of which consists of a transverse mounting plate 20 a series of rubber bars 21 of frusto-pyramidal cross section permanently affixed thereto. Each plate is formed with a pair of bolt openings 22 and may also include a plurality of sets of perforations 23 for use in anchoring the rubber bars 21 to the plates by forming plugs in these perforations. Actually in forming the rubber bars on the plates, the entire surface of the plates is coated with rubber, the coating being shown somewhat exaggerated in thickness at 25 in Fig. 1. If desired the perforations may be omitted and the bars adhered directly to the plates without using anchoring plugs.

As is conventional the bars are of uniform depth and respond uniformly under a direct axial load. In the case of eccentric loads being applied to the gear, however, the bars adjacent one end of the plate are deformed excessively while the bars adjacent the opposite end receive little or no loading. The highly deformed bars readily flow around the edges of the plate and exert transverse forces on the plate to impose excessive wear between the tension bolts 13 and the region of the bolt openings 22. In time, sufficient play will develop and the plates may actually conflict with the side sills in the draft pocket.

The present invention is concerned with arranging the spring elements so that adjacent elements cooperate directly with each other and interengage transversely to resist transverse shifting of the mounting plates and to effect an automatic realignment of the spring elements. This is accomplished by arranging the bars on the opposite faces of each transverse mounting plate in staggered spaced apart mounting relationship with the plates being oriented uniformly so that when the plates are brought together in longitudinal alignment, the bars carried on the opposed faces of adjacent plates rest in intercalated relationship.

Undoubtedly eccentric compression forces having a lateral component considerably larger than the vertical component are most common and Fig. 2 shows a mat arrangement for dissipating the effects of lateral forces resulting from eccentric lateral loading. In Fig. 2 a pair of adjacent mats are folded out to better illustrate the manner in which the plates nest together. It may be seen that on each plate the bars are substantially straight and extend vertically with the bars on one face intercalated with the bars on the opposite face. The

spacing between any given set of adjacent bars on one of the faces is large enough to accommodate the bar carried at the corresponding region on the other face. Preferably the spacing will accommodate the bar with a slight clearance as is apparent in Fig. 1.

The intermediate mats may all be constructed identically and when similarly oriented the mats will nest together with the bars on one of the opposed faces of adjacent plates fitting within the clearance spaces provided between the sets of adjacent bars on the other face. In effect, this clearance space constitutes an operating pocket for the bar that it accommodates. It will thus be seen that each bar is compressed directly between the adjacent transverse plates. Under light loading the distortion of the rubber bars is not great enough to develop any lateral reinforcing action between adjacent bars, but, of course, light loads do not set up the objectionable conditions which inspired the present invention. The compression of the bars directly between adjacent mounting plates results in a minimum thickness of compressible material that is less able to flow around the edges of the plates, but of more importance is the fact that the nested rubber bars interengage laterally and resist any tendency for relative lateral movement between the plates. The interengagement between the bars effects an automatic realignment of the mats and in addition the arrangement does not change in any way the amount of rubber that is used in the gear and hence does not lower the capacity of the gear. The continuous realigning action minimizes wear between the mounting plates and the tension bolts.

In the arrangement of Fig. 1 the outer mats 27 which engage against the bearing walls 16 of the end castings are shown with rubber bars 28 only on their inward side and the outer face which actually contacts the wall is in substantially flush contact along its entire surface.

Fig. 4 illustrates a modification of the Fig. 1 arrangement in that the end mats 27' carry a full set of rubber bars 29 on their outer faces for contact with the bearing walls 16. The contact between the rough metal surface of the end castings and the rubber bars on the end mats sets up a desirable friction drag that aids in preventing the end plates from being displaced transversely.

For those instances where the eccentric loading of the gear develops appreciable vertical shifting forces it is desirable to provide for vertical interlocking between the nested rubber bars. An arrangement for accomplishing this is shown in Fig. 3 wherein certain of the intermediate rubber bars as indicated at 21' are in effect interrupted centrally along their length to provide an operating pocket for a shortened rubber bar 30 that is appropriately positioned on the opposed face of the adjacent plate. It will be apparent that the arrangement of Fig. 3 resists transverse movement in both vertical and lateral directions.

In assembly the parts of the present gear are turned upright and assembled in the vertical position. The successive mats are stacked one on top of the other on one casting and finally the opposite casting is applied. The gear is then pre-compressed and secured by the nut and bolt assemblies. To facilitate the stacking operation and also to provide an aligning action during light loadings of the gear, certain of the rubber bars, preferably the outermost bars, are formed with integral projections or nubbins 31 which cooperate with the corresponding perforations or sockets 23' in the plate of the adjacent mat. To form the sockets a removable plug is applied prior to forming the rubber bars on the plates and when the plug is subsequently removed, a socket remains for cooperation with the projections 31. A firm and yet resilient aligning action results from the cooperation of the rubber projections formed on the bars with the sockets provided in the steel plates.

Thus the objects of the invention have been achieved in that, the spring unit of the invention automatically

maintains the alignment of the individual elements and this tendency becomes increasingly pronounced as the applied loads increase. The direct metal to metal compression on the rubber bars results in a more uniform loading of the bars and minimizes the effects of eccentric loads.

It should be understood that the description of the preferred form of the invention is for the purpose of complying with Section 112, Title 35, of the United States Code, and the appended claims should be construed as broadly as the prior art will permit.

I claim:

1. In a spring unit that is compressible along a longitudinal axis and that comprises an aligned stack of mounting plates, each of which extends transversely of said axis, spaced apart in the axial direction of the unit, with adjacent ones of said plates providing opposed working faces, and a plurality of compressible rubber bars permanently affixed thereto in the region between said faces, the improvement wherein the bars affixed to said faces have a shape and staggered spaced apart mounting relationship in directions transversely of said axis to cooperate in intercalated arrangement when said plates are in stacked alignment, with adjacent bars affixed to one of said faces forming an operating pocket slightly larger than the bar affixed to the other of said faces for intercalation between said adjacent bars, so that upon longitudinal compression of said unit said bars are engaged directly between said opposed faces and are distortable into interengagement in directions transversely of said axis for maintaining said plates aligned.

2. The arrangement of claim 1 wherein the engaging portions of certain of said bars and said faces are formed with cooperating sockets and projections that interact to maintain longitudinal alignment of said mounting plates during assembly and light loading of the spring units.

3. In a spring unit that is compressible along a longitudinal axis and that comprises an aligned stack of spring elements, each of which extends transversely of said axis, spaced apart in the axial direction of the unit, intermediate elements of said unit being identical and each consisting of a mounting plate having opposite working faces and a plurality of rubber bars permanently affixed to said faces; the improvement wherein the bars affixed to the opposite faces of each of said intermediate elements have a shape and staggered spaced apart mounting relationship in directions transversely of said axis so that the bars for the adjacent mounting plates of said intermediate elements cooperate in intercalated arrangement when said elements are in stacked alignment, with adjacent bars affixed to one of said faces forming an operating pocket slightly larger than the bar affixed to the other of said faces at a transverse position thereon intermediate said adjacent bars so that upon longitudinal compression of said unit said bars are engaged directly between said mounting plates to expand in directions transversely of said axis and interengage after a predetermined longitudinal compression of said spring unit.

4. In a draft gear of the type that includes a rubber spring unit compressible along a longitudinal horizontal axis, end castings engaging said unit at longitudinally opposite ends thereof, and tension means extending lengthwise through said unit to connect said castings and limit expansion of said unit, with said spring unit having an aligned stack of flat mounting plates, each of which extends transversely of said axis, spaced apart in the axial direction of the unit, with adjacent ones of said plates having opposed working faces, and a plurality of rubber bars permanently affixed thereto in the region between said faces, with the bars between said adjacent plates having the same maximum dimension in the longitudinal direction of the unit; the improvement wherein the bars affixed to said faces have a shape and staggered spaced apart mounting relationship in directions transversely of said axis to cooperate in intercalated arrangement when

5

said plates are in stacked alignment, with adjacent bars affixed to one of said faces forming an operating pocket slightly larger than the bar affixed to the other of said faces for intercalation between said adjacent bars, so that upon longitudinal compression of said unit said bars are engaged directly between said opposed faces and are distortable into interengagement in directions transversely of said axis for maintaining said plates aligned.

5. The arrangement of claim 4 wherein said bars on each of said faces are elongated in a vertical direction and are spaced apart horizontally to distort into interengagement in horizontal directions transversely of said axis.

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6. The arrangement of claim 4 wherein the engaging portions of certain of said bars and said faces are formed with cooperating sockets and projections that interact to maintain longitudinal alignment of said mounting plates during assembly and light loading of the spring units.

References Cited in the file of this patent

UNITED STATES PATENTS

1,890,795	Spencer	Dec. 13, 1932
2,575,491	Dath	Nov. 20, 1951
2,705,569	Tucker	Apr. 5, 1955