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(54) **FOUNDATION SUPPORT FOR
MANUFACTURED HOMES**

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(57) **ABSTRACT**

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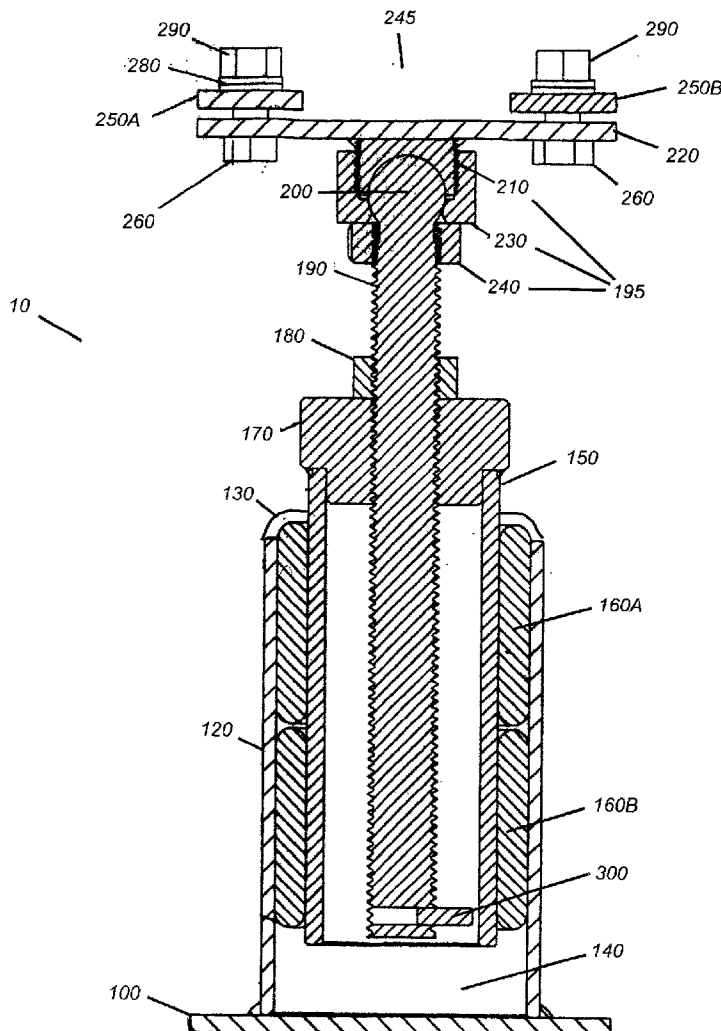
The present invention relates primarily to a foundation support for use with manufactured homes, such as mobile homes and trailers, as well as the more conventional pre-fabricated home. Using a tube-in-tube construction, where sleeves of rubber lay compressed, one adjacent the other, intermediate an inner and outer tube, provides an earthquake resistant support. The elastomeric portion of the foundation support provides isolation from vibrations produced from ground movement, wind forces or from traffic vibrations. A screw jack located centrally within the inner cylinder permits the ideal adjustment in providing and maintaining support for the manufactured building at a dead level. A ball swivel joint facilitates the installation and adjustment. As a protective safety device, to prevent the over extension of the screw jack, there is a stop at the distal end of the threaded jack rod to maintain sufficient thread engagement when the jack is fully extended.

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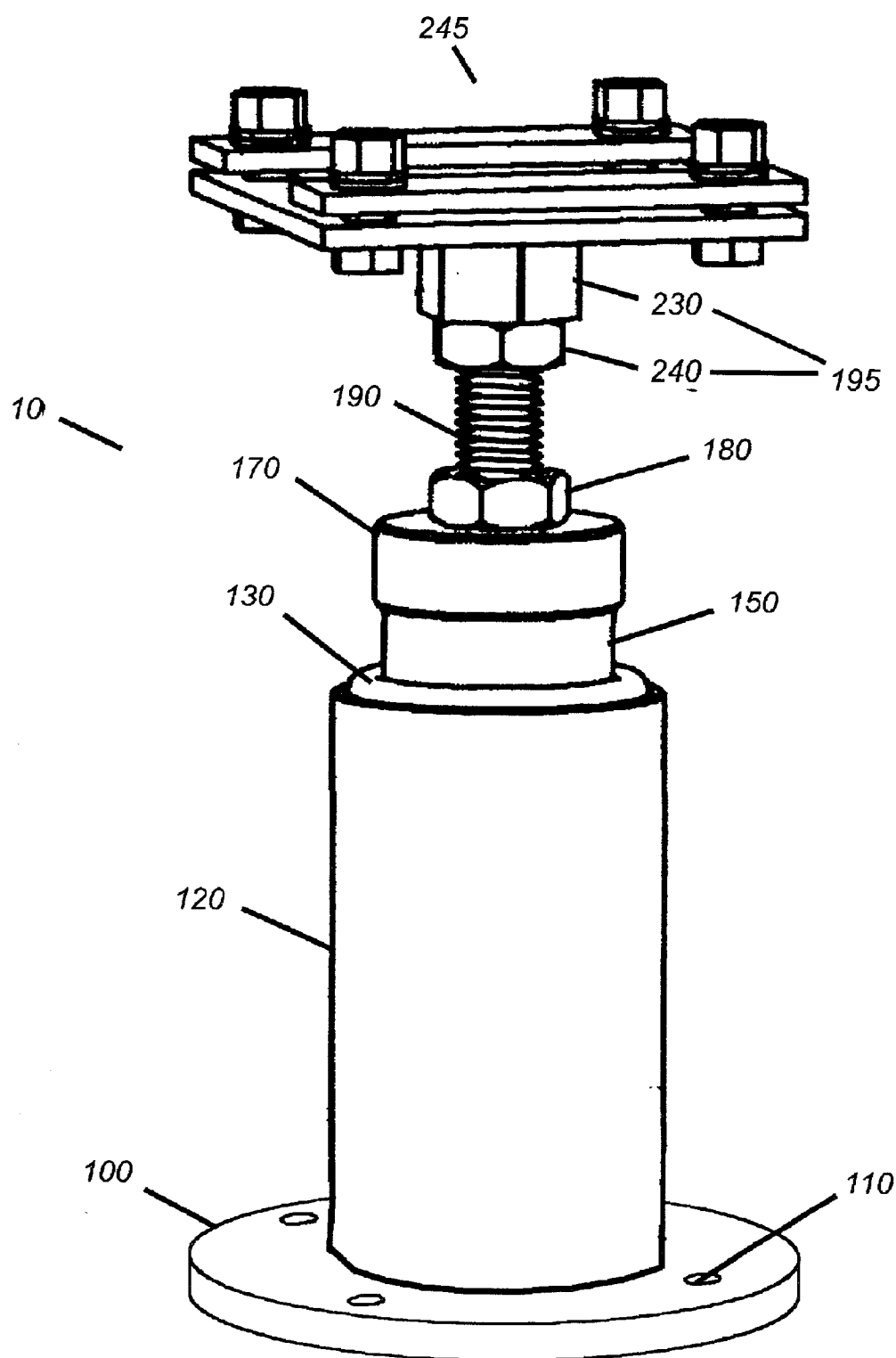


Fig. 1

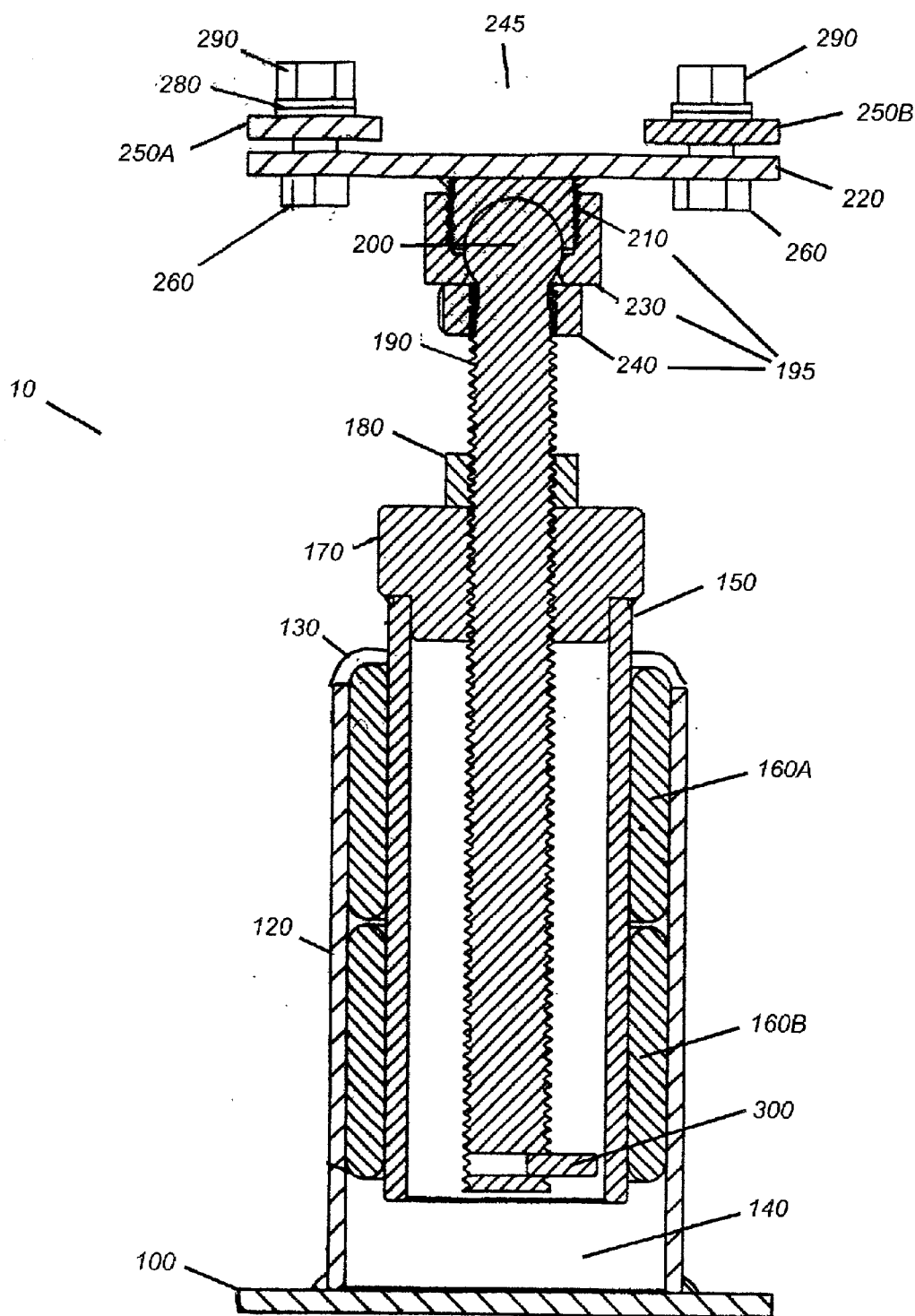


Fig. 2

FOUNDATION SUPPORT FOR MANUFACTURED HOMES

FIELD OF INVENTION

[0001] The present invention relates primarily to a foundation support apparatus and more particularly to a foundation support apparatus for use with manufactured homes.

BACKGROUND OF THE INVENTION

[0002] Today commercially manufactured homes are available in several different configurations. These include mobile homes and trailers, as well as the more conventional prefabricated style of home. These homes are skillfully manufactured and assembled at a central location and subsequently moved to its final location upon completion.

[0003] The homes are designed to be readily moved from the manufacturing plant to a location where it may be placed permanently. During the time the home is being constructed at the manufacturing plant, it rests on a pair of steel I-beam joists. Upon shipment to its permanent location, it is generally mounted on piers, where in some cases the piers are concrete blocks. Other types of mountings include the use of either pilings or stabilizing jacks.

[0004] The vertical support for a manufactured home is provided by stationary piers, the piers generally being masonry piers of concrete, or precast concrete jack stands, or prefabricated steel beams. These mounting piers are usually located beneath the steel I-beam joists that run parallel to each other upon which the manufactured home rests. The vertical supports are spaced typically eight feet apart running along each of the I-beam joists.

[0005] Once the manufactured home is installed upon the upright vertical pier supports, the home may in the future be subjected to other forces of nature, such as being moved by forces of the wind or by ground movement. Without securing the home down using conventional guy wires, straps, or other types of attachment, which connect the home with anchors secured to the ground, the home could be permanently damaged by these external forces. In fact, if these external aberrant forces of nature are great enough, the home could be shifted from its moorings and be damaged.

[0006] The use of vertical supports, such as concrete blocks and masonry piers, provide for suitable piers upon which to rest the home, but do not provide vibration isolation or seismic protection because of being too rigid.

[0007] Traditionally, in the past, springs have been used by placing them atop the vertical piers to support the inertially loaded mass. The use of springs renders the structure to become unstable in the presence of large wind forces or ground movement. With no other means of providing damping to the spring-mass system, with a small excitation, as might occur in a minor windstorm, the home could oscillate sympathetically in resonance, breaking its tethering, and dislodge the home from its moorings.

[0008] Today, there are many types of adjustable vertical support mechanisms for supporting manufactured homes. These vertical support mechanisms include screw jacks, pneumatic jacks, hydraulic jacks, where some are used in conjunction with leveler springs, air bags and the like. In general, the use of screw jacks and hydraulic jacks are too

rigid and offer no vibration isolation; the use of pneumatic jacks, air bags, or leveler springs can result in an undamped system, which could suffer instability from very small perturbations.

[0009] Examples of such prior art are shown in the examples that follow.

[0010] U.S. Pat. No. 5,123,629, granted Jan. 23, 1992, to M. Takeuchi, discloses an improved screw-type jack having an auxiliary screw barrel that is screw fitted with a supporting table in a known telescopic triple stage jack to widen the extended jack length.

[0011] U.S. Pat. No. 5,152,108, granted Oct. 6, 1992, to J. Madl, Jr., teaches of a foundation system for manufactured buildings having a plurality of spaced rigid support pedestals that are vertically adjustable to support said manufactured building. Having the pedestals shaped in a truncated pyramid form provides both lateral and vertical support for the manufactured building. An adjustable connector between the base of the pedestal and the upper end allow the height of each pedestal to be independently varied to support the manufactured home in a dead level position. To prevent the building from shifting the upper ends of the support pedestals are clamped to the flanges of the I-beams of the building chassis.

[0012] U.S. Pat. No. 5,181,356, granted Jan. 26, 1993, to T. H. Sul, discloses an earthquake resistant building support system that resists horizontal forces resulting from earthquakes, where each support is positioned on a horizontal planar base, allowing limited horizontal motion of the support relative to its base and where each support is secured to the building being supported and each base is secured to the earth. Each support includes a damping arrangement for damping horizontal oscillations of the earth. In a third embodiment, the support rests upon an O-ring compressed by the weight of the load and captivated in a groove to provide the required damping for smaller motions.

[0013] U.S. Pat. No. 5,850,718, granted Dec. 22, 1998, to C. J. MacKarvish, discloses a foundation for manufactured homes, comprising stabilizer bars, extending across the lengths of the I-beam joists, located beneath the support piers, having tie down anchors placed at the end of the stabilizer bars, so that the anchors cannot be pulled and bent toward the manufactured home, due to the forces exerted by the anchor ties. Tie down shoes serve to function to increase the resistance of the manufactured home from shifting laterally and from lifting off the foundation.

[0014] All of the above referenced prior art disclose vertical support systems that are either too rigid, having a high stiffness, or too compliant, having little or no damping.

[0015] To overcome these disadvantages of the prior art, what is needed is means of supporting a manufactured home on vertical members that provide isolation from earth vibrations and ground movement through the use of a novel energy absorbing design.

[0016] It is therefore an object of the present invention to provide for a foundation support apparatus for manufactured homes that provides isolation from ground movement, and from the forces of the wind, as well as, from undue vibrations arising from traffic.

[0017] It is another object of the present invention to provide for a foundation support apparatus for manufactured homes having an elastomeric component which serves to absorb energy produced from undesirable external forces such as from wind, earth movement, and the like.

[0018] It is still another object of the present invention to provide for a foundation support apparatus for manufactured homes having a tube within a tube construction, where the tubes are separated by an elastomeric material having viscoelastic properties, comprising an energy absorbing, element.

[0019] It is still yet another object of the present invention to provide for a foundation support apparatus for manufactured homes having a cylindrical mounting base, which will withstand most external forces arriving laterally in any radial direction.

[0020] It is another object of the present invention to provide for a foundation support apparatus for manufactured homes having a ball swivel joint at its connective end for adjustment of minor misalignments during the installation process.

[0021] It is a final object of the present invention to provide for a foundation support apparatus for manufactured homes having a ball swivel joint at its connective end to maintain positive connection even when undesirable external forces are present, should any misalignment occur as a result of these forces.

[0022] A better understanding and appreciation of these and other objects and advantages of the present invention will be obtained upon reading the following detailed description of the preferred embodiment when taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

[0023] The present invention relates primarily to a foundation support for use with manufactured homes, such as mobile homes and trailers, as well as the more conventional prefabricated style of home.

[0024] Using a tube in a tube construction, where two cylindrical sleeves of an elastomeric material, preferably natural rubber, lay compressed, one adjacent the other, intermediate the two tubes, provides an earthquake resistant support, thereby making the foundation support novel. The elastomeric elements of the foundation support provide isolation from vibrations produced from ground movement, wind forces or from traffic vibrations.

[0025] The compliance of the elastomeric elements offer a high degree of isolation from undesirable vibrations, whereas the damping portion of the elastomer absorbs the aberrant energy, thereby damping said movements.

[0026] This novel foundation support utilizes a round base to provide a universal orientation for optimal strength regardless of the direction from which the wind load is applied. The use of a small footprint permits the installation of the foundation support to be in close proximity to the edge of building being supported.

[0027] A screw jack located centrally within the inner cylinder permits the ideal adjustment in providing and maintaining support for the manufactured building at a dead

level. As a protective safety device, to prevent the over extension of the screw jack, there is a stop at the distal end of the threaded jack rod to maintain sufficient thread engagement when the jack is fully extended.

[0028] Located below the clamp assembly, which clamps to the lower flange of the I-beam, is a swivel joint that serves to accommodate the random motion of a disturbance thereby preventing the building load to shift off its support.

[0029] By means of a combination of a support system, as provided by the present invention and an anchoring system, the stabilizing system is in full compliance with the Office of Housing and Urban Development (H.U.D.), Manufactured Home Construction Safety Standard Code of Federal Regulations (C.F.R.), Part 3280.

[0030] To increase the useful lifetime of the present invention by protecting the support apparatus from violent or severe weather conditions, a weatherproof crown is positioned over the rubber sleeves to prevent the collection of water and dust.

[0031] As such, the invention comprises a foundation support apparatus for use with trailers, manufactured and prefabricated homes that incorporates a tube assembly with a lower portion fixedly mounted on a base plate and an upper portion articulating with a clamp frame comprising an adjustable clamp assembly and a means for isolating the manufactured home from ground movement, wind forces and ground vibrations.

[0032] The tube assembly provides an adjusting means for correcting elevation and any misalignment of the clamp assembly frame. The tube within a tube vibration insulator is formed by a first outer cylindrical tube surrounding a second inner cylindrical tube, with an at least one elastomeric element, compressed intermediate the two tubes, to absorb aberrant energy produced by undesirable external earth or wind forces and, to provide a damping effect for such forces.

[0033] The elastomeric element preferably consists of two adjacent sleeves of an elastomeric material that is compressed between the tubes for abatement of vibration which may emanate either from below or above the foundation support. This elastomeric material is preferably natural or synthetic rubber to provide isolation from ground movements, wind forces and traffic vibrations.

[0034] The outer cylindrical tube is welded to, and in axial alignment with, a central axis of the mounting plate. The inner cylindrical tube extends above and is in axial alignment with the outer cylindrical tube, whereby the tubes form a cylindrical facade to provide a universal orientation of the foundation support for optimal strength regardless of the direction from which the wind load is applied. A threaded cap press fitted into a top section of the inner cylindrical tube and a hex lock nut located above the cap are adapted to set and fix an elevation adjustment of the foundation support.

[0035] The desired vertical elevation of the foundation is achieved with a jackscrew bolt with threads along its entire length, culminating with a spherical ball at the upper end, and positioned centrally within the inner cylindrical tube. A hex nut threaded on the jackscrew proximally above the inner tube cap sets the desired ideal adjustment for the manufactured home at dead level.

[0036] A stop, located at the first distal end of the threaded jackscrew bolt, ensures sufficient thread engagement when the jack is fully extended as a protective safety device for preventing over extension of the jackscrew bolt.

[0037] The spherical ball articulates with a clamp frame through a swivel assembly which can be fixed in an appropriate alignment by a jam nut, that is threaded on the jackscrew just below the spherical ball surrounded by the collar. An I-beam construction typically undergirds or forms an undercarriage component of manufactured homes. Thus, the invention includes a clamp frame, usually an I-beam clamp assembly, for clamping the undercarriage component and tying down the manufactured home.

[0038] The tube in tube configuration may include a weatherproof crown positioned over the rubber sleeves to prevent the collection of water and dust to increase the useful lifetime of the support. The need for such a crown may be obviated, however, because the elastomeric elements are so compressed between the tubes that no foreign or extraneous matter is admitted.

[0039] Additional advantages of the foundation support of the invention are that it is directly securable to an anchoring foundation mount or a pier without any tie down or anchoring straps and, it has a small footprint, thereby permitting the installation of the foundation support in close proximity to the edge of a trailer being supported.

[0040] When in use for stabilizing a manufactured home using a plurality of foundation supports each secured to anchoring foundation or pier mount, the base plate is secured to the respective pier or anchor mount. The jackscrew is rotated for elevation to a desired vertical height to connect with the manufactured home I-beam or other undercarriage component. The clamp carriage is adjusted on the spherical head swivel assembly for alignment with the undercarriage component, whereupon the manufactured home undercarriage component is clamped in the clamp carriage.

[0041] The lock nut threaded on the jackscrew immediately above the tube configuration and the jam nut just below swivel assembly are then tightened to fix and retain the height and alignment settings. This method for stabilizing a manufactured home incorporates isolating the manufactured home from vibrations with the viscoelastic material compressed between the tubes; and, further, while the elastomeric material is minutely displaced by a manufactured home shear load upon the foundation support, there is a dampening of vibrations transmitted from both ground forces on the base plate and wind forces against the manufactured home by the hysteresis effect of the elastomeric material under the shear load.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] The present invention is pictorially illustrated in the accompanying drawings that are attached herein.

[0043] **FIG. 1** is a perspective view of the present invention, comprising a novel foundation support for use with manufactured homes.

[0044] **FIG. 2** is a cross sectional view of the present invention, comprising a novel foundation support for use with manufactured homes.

DETAILED DESCRIPTION OF THE INVENTION

[0045] One preferred embodiment of the adjustable jackscrew foundation support according to the present invention will be described in detail, herein, with reference to the accompanying drawings.

[0046] There is shown in **FIG. 1** a perspective view of the preferred embodiment of the present invention and in **FIG. 2**, a cross sectional view. Reference numeral **10** designates one embodiment of the adjustable foundation support for a manufactured building.

[0047] A circular mounting plate or base plate **100** and the cylindrical tube **120** provide an equal resistance to the applied forces that are produced by the wind loads and ground forces which are omnidirectional in nature. This mounting plate which may have a square shape is preferably circular and made of low carbon steel, having a plurality of mounting holes **110** into which the mounting bolts pass through to secure each support to its anchoring foundation mount. The outer cylindrical tube **120** is welded to the circular mounting plate **100** so that it is in axial alignment with the mounting plate. The outer tube is also preferably made of low carbon steel. And its cylindrical shape provides for universal, uniform resistance to the applied forces of wind loads from any direction.

[0048] In axial alignment with the outer cylindrical tube **120** is the inner tube **150**, which is also made of low carbon steel. At least one sleeve of an elastomeric material lies compressed between the tubes. In the preferred embodiment, two elastomeric sleeves **160A** and **160B**, which are made preferably of rubber, are compressed between the inner cylindrical tube **150** and the outer cylindrical tube **120**, where sleeve **160A** is installed above sleeve **160B**.

[0049] When the building inertial load is placed atop the foundation support **10**, the weight over the support places a shear load on the elastomeric sleeves **160A** and **160B** where they are displaced downwardly in several microinches of strain.

[0050] At the top of the outer cylindrical tube is the protective weatherproof crown **130** that prevents water and dust from collecting and entering into the resilient shear chamber **140**. A threaded cap **170**, made of low carbon steel, is press fitted into the top section of the inner cylindrical tube **150** and retained in position by hex lock nut **180**.

[0051] Mounted to the I-beam clamp base **220** is a swivel assembly **195**, comprising the spherical cap **210**, and the spherical collar clamp **230**, which is retained with jam nut **240**, and the swivel ball end **200**.

[0052] The jackscrew bolt **190**, made of low carbon steel, is threaded along its entire length up to its spherical ball end **200**. A spherical cap **210**, which is mounted centrally on the I-beam clamp base **220**, is seated upon the spherical ball end **200** of the jackscrew bolt **190**. The spherical collar **230**, made preferably from low carbon steel, is urged against the lower portion of the spherical ball end **200** and locked by jam nut **240**.

[0053] The I-beam clamp assembly **245** is comprised of I-beam clamp base **220**, strap clamp **250A** and **250B**, and four (4) strap clamp bolts **260**, each having a Bellville washer **280** and a hex nut **290**.

[0054] The I-beam clamp base **220** is placed beneath the lower flange of the support beam (not shown) and the two I-beam strap clamps **250A** and **250B** are placed upon the top of the leg of the I-beam, being bolted and held together using strap clamp bolts **260**, each having a Bellville washer **280**, and hex nut **290**.

[0055] During the installation process of the foundation support of the present invention, any small amount of misalignment can be accommodated by unseating the ball swivel joint assembly **195** by loosening the jam nut **240**, correcting the alignment adjustment, then retightening the ball swivel joint and jam nut **240**.

[0056] As a protective safety device, to prevent the over extension of the screw jack, there is a stop **300** at the distal end of the threaded jack rod to maintain sufficient thread engagement when the jack screw bolt **190** is fully extended.

[0057] It should be understood that even though the present invention is described in detail for its particular embodiment, there may be other variations and modifications that will become apparent to those who are skilled in the art upon reading this specification, and that these modifications or variations that can be made should not detract from the true spirit of this invention.

What is claimed is:

1) A foundation support apparatus for use with trailers, manufactured and prefabricated homes, comprising:

a tube assembly with a lower portion mounted on a base plate and an upper portion articulating with a clamp frame; and, means for isolating a manufactured home from ground movement, wind forces and ground vibrations.

2) The foundation support according to claim 1, the tube assembly further comprising an adjusting means for correcting elevation up to an underside of the manufactured home.

3) The foundation support of claim 2, further comprising a means for aligning the clamp frame to avoid any misalignment of the clamp frame.

4) The foundation support according to claim 3, the tube assembly comprising a tube in a tube vibration insulator comprising a first outer cylindrical tube surrounding a second inner cylindrical tube, with an at least one elastomeric element compressed intermediate the two tubes to absorb aberrant energy produced by undesirable external forces and to provide a damping effect for such forces.

5) The foundation support according to claim 4, said at least one elastomeric element comprising two adjacent sleeves of an elastomeric material compressed between the tubes for abatement of vibration which may emanate either from below or above the foundation support.

6) The foundation support according to claim 5, the elastomeric material comprising rubber, whereby the foundation support provides isolation from ground movements, wind forces and traffic vibrations.

7) The foundation support according to claim 6, wherein the outer cylindrical tube is welded to, and in axial alignment with, a central axis of the mounting plate.

8) The foundation support according to claim 7, wherein the inner cylindrical tube extends above and is in axial alignment with the outer cylindrical tube; said tubes comprising a cylindrical facade to provide a universal orientation of the foundation support for optimal strength regardless of a direction from which a wind load is applied.

9) The foundation support according to claim 8, further comprising a threaded cap press fitted into a top section of the inner cylindrical tube and a hex lock nut located above the cap to set an elevation adjustment of the foundation support.

10) The foundation support according to claim 9, further comprising a jackscrew bolt with first and second ends, threads along its entire length, and culminating with a spherical ball at the second end, the jackscrew bolt located centrally within the inner cylindrical tube and threaded into the threaded cap and hex lock nut thereof to permit a desired ideal adjustment in providing and maintaining support for a manufactured home at a dead level.

11) The foundation support according to claim 10, further comprising a stop at the first distal end of the threaded jackscrew bolt to maintain sufficient thread engagement when the jack is fully extended as a protective safety device, to prevent an over extension of the jackscrew bolt.

12) The foundation support according to claim 11, the spherical ball comprising a swivel joint to facilitate installation of the foundation support by correction of any misalignment thereof.

13) The foundation support according to claim 12, said clamp frame supported by a swivel assembly which comprises a spherical cap seated on the spherical ball, a collar surrounding the cap and ball, and a jam nut on the jackscrew bolt, wherein the clamp frame is fixed by the jam nut.

14) The foundation support according to claim 13, said clamp frame comprising an I-beam clamp assembly comprising a clamp base and a pair of strap clamps each having a pair of bolts, a washer and hex nut respective to each bolt, for placement of a support beam on the clamp base with each strap clamp on top of a lower flange of the beam, bolted and secured to clasp the I-beam in clamp assembly.

15) The foundation support of claim 14, further comprising a fastening means associated with said base plate for securing the foundation support to an anchor mount.

16) The foundation support of claim 15, wherein the fastening means comprises a plurality of mounting holes to receive a mounting bolt and securely fasten the foundation support to a foundation anchor mount.

17) The foundation support according to claim 16, wherein the foundation support is directly securable to an anchoring system without any tie down or anchoring straps.

18) The foundation support according to claim 17, the support having a small footprint, thereby permitting the installation of the foundation support in close proximity to the edge of a trailer being supported.

19) The foundation support according to claim 18, further comprising a weatherproof crown positioned over the rubber sleeves to prevent the collection of water and dust to increase the useful lifetime of the support by protecting the support apparatus from violent or severe weather conditions.

20) A method of stabilizing a manufactured home using a plurality of foundation supports each secured to anchor mount, wherein each foundation support comprises a base plate, a tube in tube assembly connected to the base plate, rising vertically, and including an elastomeric element compressed between two tubes comprising a vibration insulator, the tube in tube assembly containing a threaded jackscrew with a spherical head and a swivel assembly in articulation with an adjustable clamp carriage to clasp an undercarriage component of the manufactured home, comprising the steps of:

securing the base plate to an anchor mount;

elevating the jackscrew to a desired vertical height to clasp the undercarriage component;

adjusting the clamp carriage on the swivel assembly for alignment with the undercarriage component; and,

securing the undercarriage component in the clamp carriage.

21) The method of stabilizing a manufactured home according to claim 20, each foundation support further comprising a lock nut threaded on the jackscrew immediately above the tube in tube assembly and a jam nut threaded on the jackscrew immediately below the swivel assembly, comprising the additional step of:

tightening the lock nut and the jam nut to fix the desired vertical height of the jackscrew and the alignment of the swivel assembly.

22) The method of stabilizing a manufactured home according to claim 21, wherein the elastomeric element comprises a viscoelastic material, comprising the additional step of:

isolating the manufactured home from vibrations by a vibration absorption of the viscoelastic material compressed between the tubes.

23) The method of stabilizing a manufactured home according to claim 22, wherein the elastomeric material is minutely displaced by a manufactured home shear load upon the foundation support, comprising the additional step of:

dampening vibrations transmitted from both ground forces on the base plate and wind forces against the manufactured home by a hysteretic effect of the elastomeric material under the shear load.

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