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TROLLEYS FOR SUPPORTING PUMPING EQUIPMENT

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FIG.1

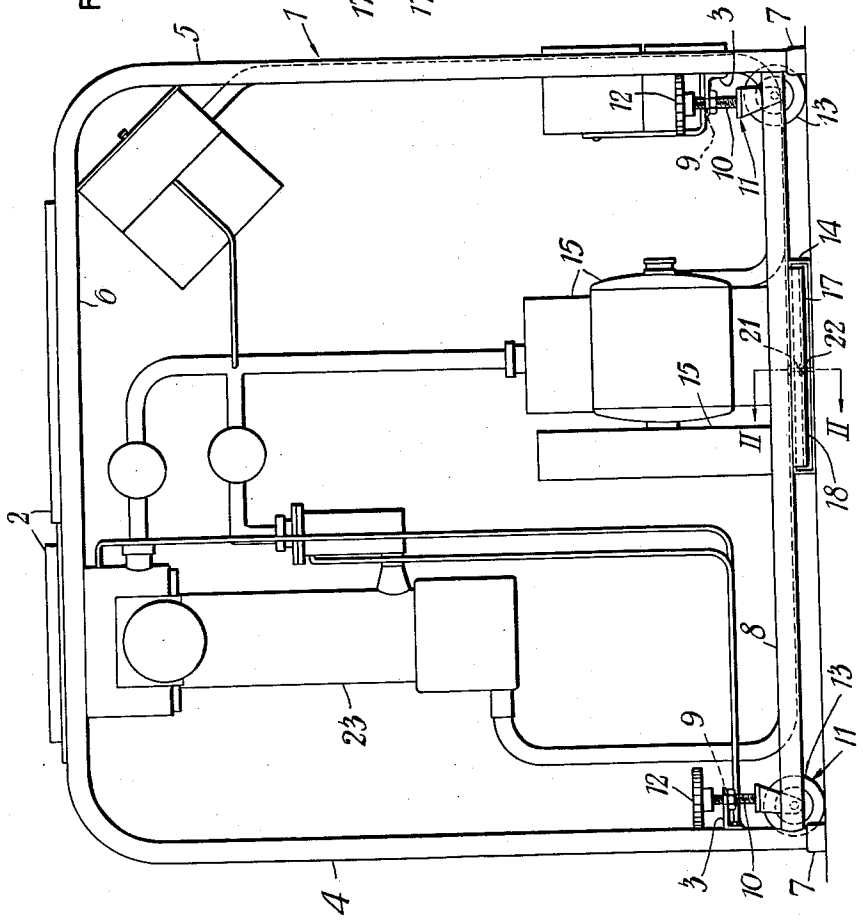
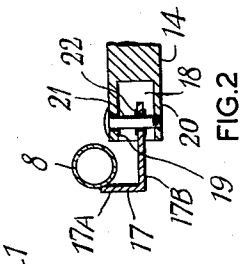


FIG.2



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TROLLEYS FOR SUPPORTING PUMPING EQUIPMENT

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This invention relates to a trolley for supporting pumping equipment.

In laboratories carrying out experiments involving high vacuum techniques the pumping equipment for evacuating the vacuum vessel is often mounted on a wheeled trolley thereby to facilitate movement of the pumping equipment from the site of one experiment to the site of another. The trolley usually supports mechanical pumping means, for example, a rotary pump and an electric motor, and a vapour pump, the rotary pump serving to back-up the vapour pump. In use, the vibrations produced by the mechanical pumping means can adversely affect the efficiency and operation of the delicate vapour pump.

It is an object of the present invention to overcome this disadvantage while at the same time preserving the essential mobility of the pumping equipment.

According to the present invention there is provided a pumping equipment supporting trolley comprising a structure for carrying vibration producing parts of said pumping equipment, a further structure for carrying other parts of said equipment, floor engaging wheels carried by one of said structures, means for displacing said wheels up and down with respect to said one structure between a raised position and a lowered position, first floor engaging means on said one structure and second floor engaging means on the other structure, said first floor engaging means being above said second floor engaging means when the wheels are in their lowered position and both engaging means contacting a floor to support the associated structure with the wheels in their raised position, the wheels being above said first floor engaging means in their raised position and floor engaging portions of said wheels being below the first floor engaging means with the wheels in their lowered position, and lifting means carried by said one structure for lifting and supporting said other structure when the wheels are in their lowered position and being out of supporting contact with the other structure when the wheels are raised.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 is an elevation of a trolley for supporting pumping equipment, and

FIG. 2 is a cross section to an enlarged scale on the line II–II of FIG. 1.

As illustrated, the trolley for supporting pumping equipment includes a frame structure including two identical horizontally-spaced, vertical side frames **1** joined to one another at the top by horizontally disposed plates **2** and at the bottom by two horizontal cross bars **3**. Each side frame **1** consists of a length of metal tubing bent into an inverted U-shape thereby to provide each side frame with two spaced upright legs **4** and **5** connected to one another at their upper ends by a horizontal cross member **6**. The plates **2** connect the horizontal cross members **6** to one another. At the free or lower end of each of the legs **4** and **5** there is provided a rubber floor-engaging ferrule **7** and at a location immediately above the ferrules **7** the two legs **4** and **5** of each side frame **1** are connected to one another by a horizontal side frame member **8** forming part of the frame structure.

The cross bars **3** each connect one leg **4** or **5** of one of the two side frames **1** to the other leg **4** or **5** of the other side frame **1** and are each arranged at a level above the level of the side frame members **8**. Each of the cross bars **3** has two vertically directed tapped holes **9** therethrough. Each of the four holes **9** serves to receive a vertical bolt **10** forming part of a castor **11**. The upper end of each bolt **10** has a knurled knob **12** thereon to enable the bolt **10** to be rotated thereby to displace the bolt **10** and hence the wheel **13** of the castor **11** vertically with respect to the frame structure.

A base structure or platform **14** upon which a rotary pump of the pumping equipment and an electric motor for driving the pump are mounted, is disposed in the rectangular area bounded by the side frame members **8** and the cross bars **3** and extends from adjacent the side frame member **8** of one frame **1** to adjacent the side frame member **8** of the other frame **1**. The rotary pump and motor are generally indicated at **15**. Each of the side frame members **8** has a short piece of angle iron **17** welded thereto. Each piece of angle iron **17** extends horizontally and is arranged so that it has one of its flanges **17A** vertical and extending upwardly from its other flange **17B** which is horizontal. The upper end of each of these vertical flanges **17A** is welded to the outer part of the associated side frame member **8** in such manner that the horizontal flange **17B** extends from below the associated side frame member **8** towards the side frame member **8** of the opposite frame **1**.

Those edges of the base structure **14** which are adjacent the side frame members **8** have slots **18** therein, the slots **18** being such that the edges of the base structure **14** are formed with horizontally extending spaced upper and lower webs **19** and **20**. Each of the webs **19** and **20** has a vertically directed hole therethrough and a stud **21** is passed through the hole in each top web **19** and into the hole in the bottom web **20**, the hole in the bottom web **20** being tapped. The head of the stud **21** contacts the upper surface of the upper web **19**. The horizontal flange **17B** of each of the pieces of angle iron **17** has a corresponding hole therethrough and a rubber grommet **22** is disposed in each of the holes in the angle iron **17**. One of the studs **21** is passed through each grommet **22** so that the horizontal flange **17B** of the length of angle iron **17** is guided by cooperation between the grommet **22** and the stud **21**. The vertical movements of the horizontal flanges **17B** with respect to the base structure **15** are limited by the upper and lower webs **19** and **20** between which the flange **17B** lies.

The trolley described above may be moved from place to place in a laboratory on the wheels **13** of its castors **11** when the bolts **10** of the castors **11** are adjusted to cause the horizontal flanges **17B** of the angle irons **17** to engage the undersides of the upper webs **19** of the base structure **14** whereby the latter is supported by the frame structure. When it is desired to use the pumping equipment, the bolts **10** of the castors **11** are rotated so that the frame structure is lowered relatively to the wheels **13** of the castors **11**. The under surface of the base structure **14** is situated at a lower level than the rubber ferrules **7** when the trolley is supported on the castors **11**, so that when the bolts **10** of the castors **11** are rotated to lower the frame structure and hence the base structure **14**, the under surface of the base structure **14** contacts the floor before the rubber ferrules **7**. Upon continued rotation of the bolts **10**, the frame structure is lowered with respect to the base structure **14**, the rubber grommets **22** of the angle irons **17** moving down the studs **21** as the frame structure is lowered with respect to the base structure **14**. Eventually the rubber ferrules **7** contact the floor and the frame and the base structure **14** are thus independently supported by the floor. This minimizes

transfer of vibration from the base structure **14** to the frame structure when the pump and motor **15** are in operation. The frame structure carries those parts of the pumping equipment, such as a vapour pump **23**, which might be adversely affected by vibrations.

When it is desired to move the trolley after use of the pumping equipment, the bolts **10** are rotated in the opposite direction so that the frame structure is raised with respect to the castors **11** to a position clear of the floor. The horizontal flanges **17B** move up the studs **21** and eventually the under surface of the upper webs **19** are engaged by the horizontal flanges **17B** and the base structure **14** is raised clear of the floor to be supported by the frame structure.

I claim:

1. An equipment trolley comprising:

a first supporting structure including first floor-engaging means depending therefrom;

floor engaging wheels operatively connected to the first structure;

means connected to the wheels and the first supporting structure for relatively displacing the wheels vertically with respect to the first structure;

a second supporting structure including second floor-engaging means depending therefrom, the second floor-engaging means being relatively vertically disposed with respect to the first floor-engaging means when both floor-engaging means are raised above the floor; and

connecting means extending between the first and second structures including a lost motion means permitting relative vertical movement between the two supporting members, the relative vertical movement defined by the lost motion means being greater in distance than the relative vertical disposition of the first and second floor-engaging means so that the first and second supporting structures can be supported on the floor independently of each other.

2. The structure defined in claim **1** wherein the second floor-engaging means is disposed in a position closer to the floor than the first floor-engaging means when the first floor-engaging means is raised above the floor, the raising of the second supporting structure above the floor being effected by operating the displacing means to move the first supporting structure vertically above the floor and into contact with the second supporting structure, after passing through the lost-motion phase of the operation, whereby continued upward movement of the first support structure causes the second support structure to be raised above the floor, the lost-motion means enabling the first and second supporting structures to be supported on the floor independently of each other so that the transfer of vibrations from one supporting structure to the other supporting structure will be minimized.

3. The apparatus defined in claim **1** wherein the first supporting structure comprises a frame structure defining an interior space and the second supporting structure comprises a platform positioned within the interior space bounded by the frame structure.

4. The apparatus defined in claim **1** wherein the wheel displacing means comprises at least one threaded bolt secured at one end to a wheel and a bolt turning means secured to the other end of the bolt and wherein the first supporting structure has a tapped hole through which the bolt is threaded.

5. The apparatus defined in claim **1** wherein the connecting means comprises a plate secured to the first supporting structure, a web secured to the second supporting structure and extending into partially overlapping relationship with the plate, and means effecting a connection between the plate and web which allows relative vertical movement between the plate and web.

6. The apparatus defined in claim **5** wherein the plate has an aperture through its free end and including a stud secured to the web and extending through the aperture of the plate for allowing the plate to move vertically on the stud relative to the web.

7. The apparatus defined in claim **6** wherein the portion of the stud on which the plate is mounted has a length greater than the relative vertically disposed distance between the first and second floor-engaging means when both floor-engaging means are supported above the floor.

8. The apparatus defined in claim **6** additionally comprising a resilient grommet bounding and defining the aperture through the plate, the stud passing through the grommet whereby the resilient grommet reduces the vibrations passed between the supporting structures.

9. The apparatus defined in claim **5** wherein the connecting means comprises an L-shaped plate having one leg attached to and vertically depending from the first structure and a second leg extending substantially horizontally inwardly from the free end of the first leg, the free end of the second leg having an aperture therethrough, and a pair of vertically disposed webs attached to the second supporting structure and extending outwardly therefrom to form a yoke, the webs having a stud extending therebetween, the second leg of the L-shaped plate being received between the webs so that the stud passes through the aperture.

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