April 14, 1959 F. W. GARNER 2,882,032

HEAT TREATMENT RACK

Filed Jan. 13, 1955

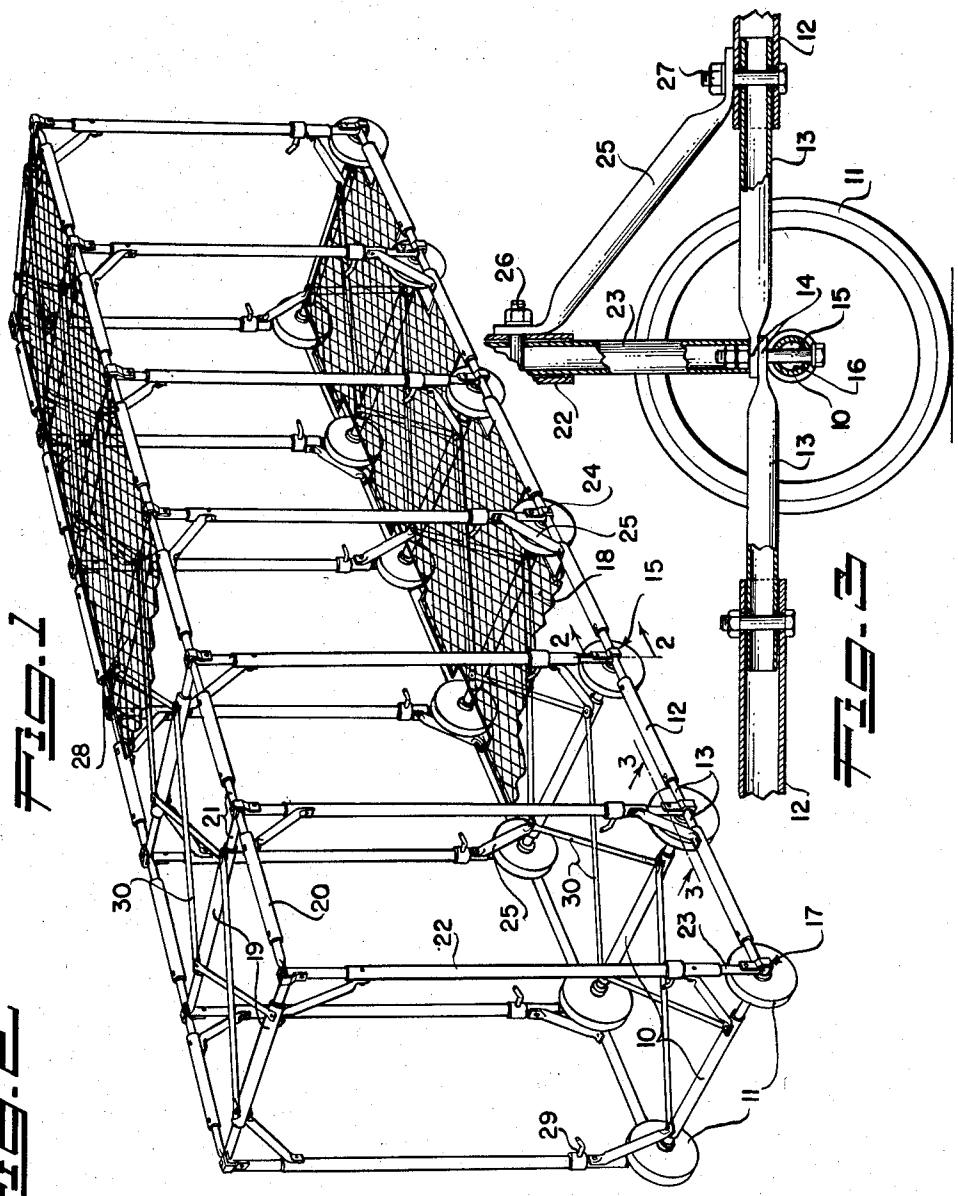


FIG. 1

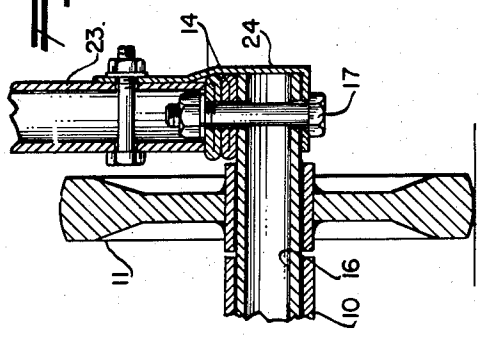


FIG. 2

FIG. 3

INVENTOR.
FRED W. GARNER

BY

George C. Sullivan
Agent

United States Patent Office 2,882,032 Patented Apr. 14, 1959

2,882,032

HEAT TREATMENT RACK

Fred W. Garner, Los Angeles, Calif., assignor to Lockheed Aircraft Corporation, Burbank, Calif.

Application January 13, 1955, Serial No. 481,588

2 Claims. (Cl. 263—47)

This invention relates to an improved heat treatment rack to support articles being heated and then quenched to develop their full strength after forming to shape.

Heretofore, such heat treatment racks have been built up as stiff welded structures which are rigid and inflexible and therefore soon warp and sag out of shape due to the repeated heating and quenching thereof in normal use. Such racks are used to carry parts through sequential heating and quenching cycles by pushing the racks onto an elevator to be lifted into a heating oven, and after the heating cycle, lowered directly into a quenching tank. It is therefor an object of this invention to provide a heat treatment rack that will survive repeated expansion and contraction due to the heating and quenching cycles without warping, and to that end I provide bolted braces and slip joints for pliability in a vertical plane while maintaining rigidity in plan form by the use of cross-bracing.

It is a further object of this invention to provide a multiple wheeled heat treatment rack of the type described wherein the rack is alternately braced to stand upright and straight in line with bolted slip joints for vertical pliability, whereby each of the wheels carry their share of the load on an uneven floor. The vertical pliability of the rack allows the wheels to set solidly on the ground or the oven hoist with the weight distributed over the multiple wheels thus eliminating any tendency of the rack to warp or sag into contact with the oven walls during the heating cycle.

It is another object of this invention to provide a light weight, easily handled rack of the type described to facilitate loading and unloading and reduce the heating and quenching times of the heat treatment cycle.

Other objects and advantages of my invention will appear from the following description taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a heat treatment rack embodying the novel features of my invention;

Figure 2 is an enlarged detail section of one of the wheel mounts, taken on the line 2—2 of Figure 1;

Figure 3 is an enlarged detail section at right angles to the showing of Figure 2, taken on the line 3—3 of Figure 1.

As shown on the drawings:

The heat treatment rack of this invention comprises a loosely jointed rectangular framework connecting a series of axles **10** each carrying two wheels **11**. The framework comprises spacer tubes **12** between the ends of each axle, which tubes have "loose" or "free" telescopic connections with tubes **13**. In the drawings I have shown the end parts of the tubes **13** engaged or telescoped in the end portions of the spacer tubes **12** with clearance, that is the inside diameters of the tubes **12** are greater than the outside diameters of their related tubes **13**. The ends of the spacer tubes **12** are retained in the tubes **13** for limited axial and "universal" movement by bolts **27** loosely fitting their respective openings. While these loose joints permit relative movement between the tubes **12** and **13**

the tubes are positively connected against separation and relative motions of the related tubes are limited, flattened ends **14** bolted together at **15** and to slip tubes **16** protruding from the ends of the axles, as best shown in Figures 2 and 3. These connections **15** comprise bolts **17** freely passing through oversize vertical openings in the superimposed flattened ends **14** and tubes **16** and the tubes **16** have play or loose engagement in their respective axles **10**, all as shown in Figures 2 and 3. These arrangements provide slack or "give" at the bolted connections, and the rectangular frame so formed is laterally or transversely stiff but vertically pliant to allow any wheel or axle to rise or fall to conform to an uneven ground. The rectangularity of the frame is further maintained by cross-bracing **30** and a stiff wire screen **18** laid over the axles and fastened to the side tubes to assist in resisting lateral distortion of the rack **12**. The screen **18** also serves to prevent articles being treated from dropping through the framework to the ground.

An upper framework is formed similar to that just described with cross members **19** and longitudinal spacers **20** having slip tubes **21** bolted in the ends thereof. These frame members are loosely connected in the same manner as the tubes **12**, **13** and **16** of the lower framework. Uprights **22** at each wheel location similarly have slip tubes **23** at each end, the upper and lower frameworks being tied thereto by clips **24** engaged under the head of the bolts **17** with their other ends bolted to the slip tubes **23**. In alternate panels diagonal braces **25** engage between bolts **26** through the uprights **22** and the slip tubes **23** and the spacer tube **12** connecting bolt **27** to its slip tubes **13**.

The upper framework is provided with cross-bracing **30** and screen stiffening **28** similar to the screen **18**, which screen serves as a support for hooks (not shown) used to suspend the articles to be heat treated. By so suspending the articles, warpage thereof is greatly reduced during processing and the articles are uniformly heated and quenched during the operation. The uprights **22** carry spacers **29** with hooks to support an intermediate shelf if desired.

The heat treatment rack above described provides a vertically articulated multiple wheel rack wherein individual wheels may settle or be lifted by ground irregularities while carrying their share of the load. This articulation is limited to up and down movement of the wheels by the cross-bracing and screens stiffening both the upper and lower frameworks against lateral deflections. While the relative movement at any one metal to metal joint is small it is yet enough to prevent the transmission of expansion and compression strains through the joints and thus prevents warping or sagging of the rack under load and thermal stresses during the repeated heat treating cycles of heating and rapid quenching.

Having thus described my invention and the present preferred embodiments thereof, I desire to emphasize the fact that many modifications may be resorted to in manner limited only by a just interpretation of the following claims.

I claim as my invention:

1. A heat treatment rack for carrying articles to be heated and quenched comprising a plurality of axles carrying wheels for supporting the rack, each axle comprising a wheel spacing tube and a slip tube bolted to the spacer tube, top and bottom frameworks comprising spacer tubes between the axles, slip tubes loosely telescopically engaged with the ends of the spacer tubes for limited relative movement, loose-bolt connections connecting the axle slip tubes to the adjacent slip tubes of the framework spacer tubes for limited relative move-

ment, vertical spacer tubes having slip tubes tied to the loose-bolt connections connecting the axle and framework slip tubes, and diagonal braces connecting the framework spacer tubes and vertical spacer tubes in alternate panels, whereby to form a laterally stiff but vertically flexible rack incapable of developing thermal stresses at the joints.

2. A heat treatment rack as described in claim 1 including cross-bracing members disposed between said axles, and woven screen wire fastened over the frameworks serve to maintain the longitudinal alignment thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

564,568	Meyer	July 21, 1896
1,367,672	Smith	Feb. 8, 1921
1,649,065	Jarvis et al.	Nov. 15, 1927
2,215,425	Longfellow	Sept. 17, 1940
2,453,845	Jackson	Nov. 16, 1948
2,601,980	Menough	July 1, 1952
2,738,542	Clark	Mar. 20, 1956

FOREIGN PATENTS

193,400	Great Britain	Apr. 26, 1923