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STORAGE RACK AND SPRINKLER ARRANGEMENT

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Fig. 1

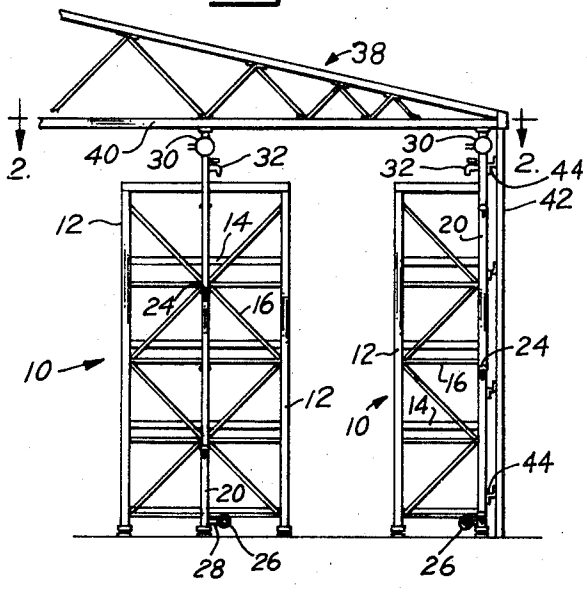



Fig. 3

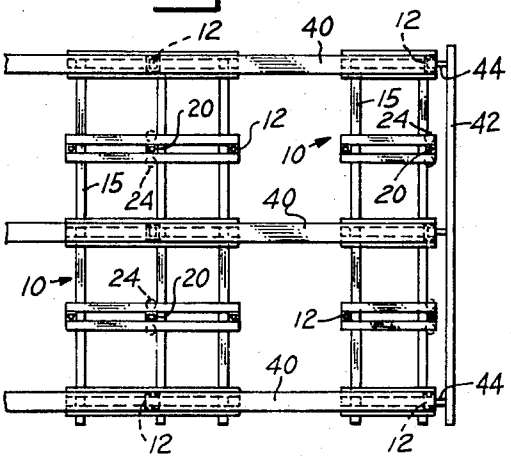



Fig. 2

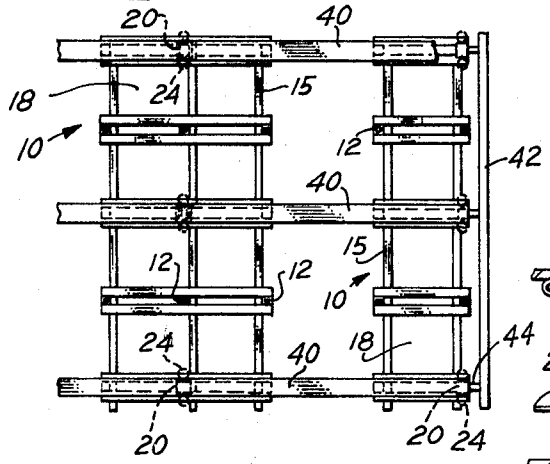



Fig. 4

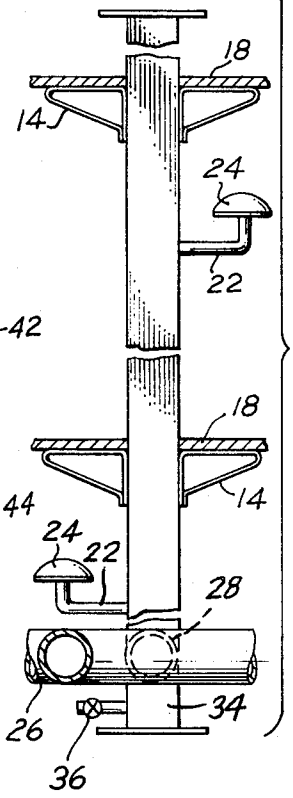
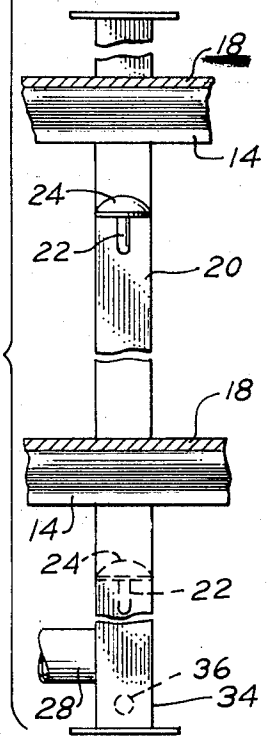



Fig. 5




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# STORAGE RACK AND SPRINKLER ARRANGEMENT

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## ABSTRACT OF THE DISCLOSURE

A storage rack and sprinkler arrangement wherein vertical tubular supports, having alternately spaced sprinkler heads thereon, vertically support the racks while simultaneously conveying fire extinguishing liquid to the sprinkler heads. The vertical tubular supports and/or other vertical rack supports may also support a roof and wall panels to provide a structure for enclosing the racks.

## BACKGROUND OF THE INVENTION

This invention relates to a storage rack and sprinkler arrangement and, more particularly, to a new and improved arrangement where the sprinkler fluid conveying conduits are arranged to act as support members themselves.

Fire sprinkler systems are usually required, by local law, to be installed in warehouse and other article storage areas. Previous sprinkler systems were installed as separate building accessories and were related to the articles stored and the racks that they were stored upon only to the extent that the sprinkler heads were generally located in the same building space as the articles and racks. Such prior arrangements necessitated the extensive repetitive use of separate structural construction materials to support the article storage racks, the roof and walls of the building and the sprinkler system itself. Such repetitive use of structural materials was wasteful of both time and materials. Moreover, the sprinkler heads were frequently located a substantial distance from the stored articles and their storage racks, thereby substantially reducing the system's effectiveness in the event of fire.

It is accordingly a principal object of the invention to provide a new and improved storage rack and sprinkler arrangement which substantially reduces the expenditure of both time and materials and in which the sprinkling assembly is itself utilized as a support structure.

It is also a principal object of the invention to provide a new and improved storage rack and sprinkler arrangement wherein the sprinkler heads are arranged in close proximity to the stored articles to provide an effective extinguishing arrangement in the event of fire.

## SUMMARY OF THE INVENTION

In a principal aspect, the invention takes the form of a new and improved interrelationship of a fire extinguishing assembly with the storage racks and the building structure which the system is designed to protect. Sprinkler heads are vertically arranged, proximate to the storage racks, upon an extinguishing fluid carrying tubular support. The tubular support is positioned to support the storage racks and/or the roof and side panels of a building structure which houses the storage racks.

These and other objects, features and advantages of the present invention will be more clearly understood when considering the following detailed description.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the course of the description, reference will frequently be made to the attached drawings, in which:



FIG. 1 is an elevation view of a preferred embodiment of the storage rack, building structure and sprinkler arrangement of the present invention;

FIG. 2 is a plan view of said embodiment of the invention taken along line 2—2 of FIG. 1;

FIG. 3 is a plan view of another embodiment of the invention;

FIG. 4 is an enlarged elevation view of the sprinkler and rack arrangement of the present invention; and

FIG. 5 is an elevation view of the sprinkler and rack arrangement of FIG. 4 rotated 90°.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, one or more metal storage racks **10** are provided for the storage of articles. Each of the storage racks **10** includes a plurality of vertical supports **12** and a plurality of horizontal supports **14** and **15** extending along the depth and length, respectively, of the racks **10**. Additional ancillary supports **16** may be provided, if necessary, to provide a stable, rigid storage rack assembly. All of the horizontal supports **14** support storage shelves **18** which, in turn, carry either the articles themselves or pallets filled with the articles, as shown in FIGS. 4 and 5.

The storage racks **10** are further vertically supported by vertical tubular supports **20** which are an integral part of the racks and which are interspersed between the vertical supports **12**, as shown in FIGS. 2 and 3. These tubular supports **20** perform both the latter mentioned support function as well as operate to deliver fire extinguishing fluid, such as water, to the storage racks **10** and the articles stored thereon. To provide for ease in attaching the horizontal supports **14** to the tubular supports **20**, the tubular supports are preferably square or rectangular in cross-section. Each of the tubular supports **20** is constructed of suitable materials and is of suitable thickness to withstand the pressure of the water therein and also the stresses produced by the structures which they support. More specifically, each of the tubular conduits, when finally installed, is adapted to pass the particular fire code test requirements of the locality for fire sprinkler systems which, for example in some localities, is 200 p.s.i. for two hours. The tubular supports **20** include a plurality of branch conduits **22** spaced along their length and extending angularly therefrom. Disposed at the end of each of the branch conduits **22**, is a conventional heat actuated sprinkler head **24**. Preferably, each of the branch conduits and sprinkler heads is disposed upon alternating sides of its tubular support **20**. Hence, as shown in FIG. 4, the upper branch conduit **22** and sprinkler head **24** extend to the right of the tubular support **20** while the next adjacent lower branch conduit **22** and sprinkler head **24** extend to the left of its tubular support **20**. The alternating vertical disposition of the sprinkler heads along its tubular support **20** avoids the possible situation from arising where the spray produced upon the initiation of one sprinkler head would cool the adjacent sprinkler head to the extent that its sprinkling action would not be initiated. However, the sprinkler heads **24** may, in the alternative, be located on one or all sides of the tubular support, if desired.

As shown in FIGS. 4 and 5, a suitable main **26**, which is connected to a water supply under pressure, is connected to, and operates to supply, each of the tubular supports by connecting branch conduits **28**. The point of connection of the branch conduits **28** to the tubular supports **20** is spaced a short distance above the lowest extending portion of the tubular supports. Such displacement provides a sump **34** at the very bottom of the tubular supports **20**. The sump acts to collect dirt, scale and other foreign matter which might plug the sprinkler heads **24** during their operation. The foreign matter tends to

settle in sump **34** where it may be periodically withdrawn by a valved tap **36** which is located at the bottom of the sump. The main **26** may be located at the top of the tubular supports, if desired, the sump still being provided at the bottom of the tubular supports.

As shown in FIG. 1, each of the tubular supports **20** preferably includes at its top, a pressure relief valve **30**. The purpose of pressure relief valve **30** is to relieve any steam which might be generated in the water within the tubular support, by transfer of heat thereto through the support in the event of fire. Such steam, if generated, would impede the continuous flow of water to the sprinkler heads **24**. Also disposed at the top of each of the tubular supports **20** is a valved tap **32** for bleeding trapped air from each tubular support when the system is initially charged with water.

In one embodiment of the invention, the tubular supports **20**, in addition to vertically supporting the storage racks **10**, also support the building structure which houses the storage racks. As shown in FIGS. 1 and 2, a roof **38** is provided having a plurality of generally horizontal trusses **40**. The tops of the storage racks **10** may be adjacent the trusses **40** or they may be disposed a short distance below the trusses as shown in FIG. 1. In either instance, the tops of the tubular supports **20** are arranged in supporting relationship with their associated trusses **40** such that the supports also support the trusses and their associated roof. The tubular supports **20** of the storage racks about the outer periphery of the storage area, may also include suitable fasteners **44** for attaching building wall panels **42**. Thus, a complete building structure may be provided wherein the tubular supports **20**, not only deliver water to the fire extinguishing sprinkler heads, but also support the storage racks as well as the building structure surrounding the storage racks. Preferably, the fasteners **44** are affixed to the tubular supports by a method which avoids puncturing the tubular supports, e.g. welding.

Another embodiment is shown in FIG. 3, wherein the tubular supports **20** which deliver the fire extinguishing water only support the storage racks **10**. The roof truss **40** and/or building wall panels **42** are supported by at least some of the vertical supports **12** of the storage racks. This embodiment is desirable where it is sought to minimize the stresses which bear upon the pressurized water carrying tubular supports **20**. Each of the embodiments shown in FIGS. 2 and 3, eliminates the necessity of additional structural materials solely for support of the building structure.

By utilizing the vertical water carrying tubular support **20** for the vertical support of the storage racks **10**, location of the sprinkler heads closely adjacent to the stored articles themselves is made possible rather than merely locating the sprinkler system in the same space as the articles. Thus, while minimizing the amount of construction materials necessary, optimum fire protection capabilities within the storage space may be realized. Moreover, the arrangement wherein either the tubular supports **20** or the vertical supports **12** support the storage racks **10**, the roof **38**, and/or the wall panels **42**, a substantial reduction in the amount of construction material necessary to complete the entire storage assembly is made possible. The arrangement of the present invention is particularly suited for use with prefab or preconstruction techniques.

It is to be understood that the embodiments of the invention which have been described are merely illustrative of a few applications of the principles of the invention. Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention.

What is claimed is:

**1.** An article storage arrangement having at least one fire protected rack which includes a plurality of tiers for the storage of articles, said arrangement comprising;

tubular support means both supporting tiers of said rack and constructed to convey a pressurized fire extinguishing liquid therethrough,

a supply main communicating with the interior of said tubular support means to supply the interior of said support means with said pressurized fire extinguishing liquid, and

a plurality of sprinkler means communicating with the interior of said tubular support means at spaced intervals along its length and positioned adjacent tiers of the rack, said sprinkler means including means to actuate said sprinkler means in response to heat in the event of fire to initiate a substantial flow of said pressurized extinguishing liquid through said tubular support means and to discharge said flowing liquid to said tiers.

**2.** The article storage arrangement of claim **1**, further including;

a roof structure disposed over said rack, and

at least some of said tubular support means which convey said fire extinguishing liquid also helping to support said roof structure.

**3.** The article storage arrangement of claim **1** wherein said rack includes fastening means for attaching and supporting a wall structure whereby an enclosure may be provided to enclose said rack.

**4.** The article storage arrangement of claim **3** wherein said fastening means are disposed on at least some of said tubular support means of said racks.

**5.** The article storage arrangement of claim **1**, wherein each tubular support of the tubular support means includes pressure relief means adjacent its uppermost end.

**6.** The article storage arrangement of claim **1**, wherein said tubular support is of rectangular cross-section.

**7.** A construction as in claim **1** wherein the sprinkler means includes a plurality of heat actuated sprinkler heads each positioned and arranged so as not to be inhibited in operation by spray from another sprinkler head.

**8.** A construction as in claim **1** wherein a portion of each tubular support of said tubular support means includes a tubular portion located lower than the point of communication of the tubular support to the supply main, thereby providing a sump for the tubular support.

**9.** A construction as in claim **8** including means for selectively withdrawing liquid from the sump for the tubular support.

**10.** A construction as in claim **1** wherein pressure relief means are provided for the tubular support means, for venting such steam as is generated by the fire extinguishing liquid that is within, or which flows through, said tubular support means and which absorbs heat transmitted thereto through the tubular support means in the event of fire.


**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 149,669 | 4/1874 | Miller | 182—52 |
| 809,778 | 1/1906 | Collins | 182—52 |
| 909,336 | 1/1909 | Riedy | 211—183 X |
| 924,500 | 6/1909 | Rush | 312—115 |
| 2,001,215 | 5/1935 | Ruppel | 52—93 X |
| 3,131,792 | 5/1964 | Groneman et al. | 52—731 X |



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