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(54) **Improved apparatus for safe storage of fluorescent light tubes**

(57) An improved fluorescent tube storage apparatus (4), for safely and conveniently storing fluorescent light tubes (2,3), has rows of dividers (8) which form channels between them. Spaced rows of channels (12) are aligned to allow long objects, such as large fluorescent tubes (2,3), to be held therein. The channels are formed by dividers which are adapted (for example by foam pads (14)) to grip the fluorescent tubes (2,3). In use, the storage apparatus can be mounted on a ladder, and have carry straps to carry it when not in use. Fluorescent tubes can be inserted from the front and extracted from the top.

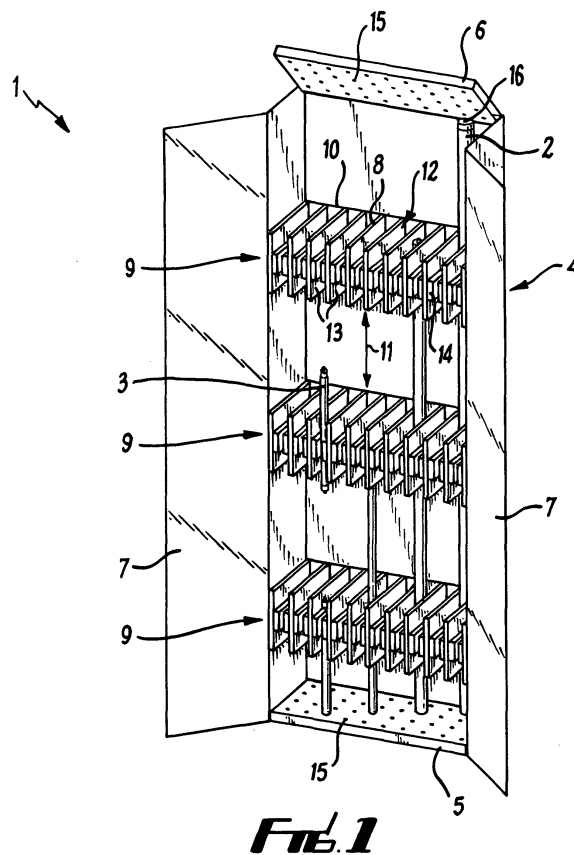


Fig. 1

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Description

[0001] The present invention relates to an apparatus for safe storage of fluorescent light tubes. In particular, a container for safely retaining various sizes of fluorescent tubes is disclosed which allows for easy retrieval of the fluorescent tubes.

[0002] In the field of light-fitting and more specifically in the field of replacing fluorescent tubes and bulbs, a particular designated person (contracted to do so or otherwise) often takes charge. Quite often this person will have a large number of tubes or bulbs to replace at one time.

[0003] Common practice is to have a long box into which old, broken and/or faulty fluorescent tubes are inserted, and from which new fluorescent tubes may be taken. Generally, as a fluorescent tube is slid into the box it is allowed to fall for the last portion of its travel. This can cause damage and/or breakage. One result of this is that recycling of the fluorescent tube is made more difficult. Furthermore, as the tube itself is brittle, bits of the glass can break off and cause an injury risk. Breakage also results in release of the poisonous chemicals stored within. Although present in small concentrations, mercury, for example, can be released.

[0004] Such practice is not particularly suited for situations where different lengths of fluorescent tube are required to be replaced. Smaller tubes will fall to the bottom of the box, and may not be retrievable without considerable effort. Smaller tubes are also therefore more vulnerable to breakage from the fall into the box. It is possible that a long box for long tubes and a short box for short tubes could be carried; however the load on the fitter, who may already be carrying a ladder, will be prohibitive. It would also require carrying of a different box for other kinds of light fittings, e.g. lightbulbs or fluorescent rings.

[0005] It is an object of the present invention to provide an improved apparatus for safe storage of fluorescent tubes that obviates and mitigates one or more of the disadvantages and limitations of the prior art.

[0006] According to a first aspect of the present invention there is provided a fluorescent tube storage apparatus, the storage apparatus comprising a plurality of channels, the channels arranged in at least one row, wherein the channels are adapted so as to removably retain a fluorescent tube.

[0007] Preferably the storage apparatus further comprises a plurality of dividers. Preferably opposing faces of adjacent dividers form the channels.

[0008] Preferably the dividers are at least partially deformable.

[0009] Optionally the dividers comprise deformable grip portions. These grip portions may be constructed from a foam material or some other deformable material which has a bias towards its original shape.

[0010] Optionally the grip portions are shaped so as to improve hold. Examples are tapers, corrugations and sawtooth shapes.

[0011] Advantageously the dividers and deformable grip portions are sized such that the channels are smaller than the object to be retained.

[0012] Preferably the storage apparatus further comprises a support structure, the support structure adapted to fixedly locate the at least one row of channels.

[0013] Optionally the channels are arranged in one row of channels extending substantially the length of the support structure.

[0014] Advantageously the channels are arranged in at least two rows. Preferably the at least two rows extend substantially less than the length of the support structure.

[0015] Preferably the support structure aligns the channels of the at least one row of channels.

[0016] Optionally the support structure comprises mounting means. This allows the storage apparatus to be mounted, for example, on a wall or on the support legs of a set of ladders.

[0017] Preferably the channels are substantially u-shaped in cross section.

[0018] Preferably each divider is formed by two coextending surfaces, joined at at least one end and having a gap therebetween.

[0019] Preferably the two coextending surfaces are substantially parallel.

[0020] Optionally the two coextending surfaces extend so as to form a tapered divider.

[0021] Preferably each of the at least one row is formed from a single piece of sheet material, adapted to form the dividers.

[0022] Preferably the support structure is comprised of a sheet material.

[0023] Preferably the support structure comprises a top and a bottom end, the top end open and the bottom end having an abutment.

[0024] The abutment prevents movement of objects located within the storage apparatus beyond a predetermined limit.

[0025] Alternatively the top end has a closable lid. Further alternatively the top end is closed.

[0026] Alternatively the support structure substantially takes the form of a box, the at least one row located therein.

[0027] Optionally the box comprises carry straps.

[0028] The present invention will now be described by way of example only and with reference to the accompanying figures in which:

Figure 1 illustrates a freestanding storage apparatus in accordance with the present invention;

Figure 2 illustrates one embodiment of the channels defined by the dividers;

Figure 3 illustrates an alternative embodiment of the channels using tapered dividers;

Figure 4 illustrates a further alternative embodiment

of the channels in which an object is held by a corrugation;

Figure 5 illustrates yet another alternative embodiment of the channels with a sawtooth cross section for holding the object;

Figure 6 illustrates a ladder mounted storage apparatus in accordance with the present invention;

Figure 7 illustrates a smaller object being held in a similarly sized channel;

Figure 8 illustrates a larger, circular object being held by two distinctly separate channels; and

Figure 9 illustrates a storage apparatus in use to hold a number of different sizes and shapes of light fittings.

[0029] With reference to Figure 1, there is presented a storage apparatus 1 for the storage of various shapes and sizes of fluorescent lamps. By way of example, the storage apparatus 1 is shown to be safely and removably retaining a large fluorescent tube 2 and a small fluorescent tube 3.

[0030] The storage apparatus 1 is formed by a support structure in the form of a box 4 constructed from a single sheet of material. The box 4 is closed at the bottom end by an abutment 5 and open at the top end by means of a top flap 6. The top flap 6 gives top down access, for example for retrieving the large fluorescent tube 2 from above, without the need to disturb any other objects located in front of it.

[0031] The front of the box is also open by means of front flaps 7. These front flaps 7 again give easy access to any objects in the storage apparatus 1. This front access provides a much easier way of inserting objects such as the large fluorescent tube 2, which may thereafter be removed again from the front or indeed from the top.

[0032] Dividers 8 are located which extend for the entire depth of the box 4. Three rows 9 of dividers 8 are arranged within the box 4, positioned between the top flap 6 and the abutment 5 with a fairly uniform distribution. The rows 9 of dividers are formed by single lengths of a sheet material 10, folded or otherwise arranged in a concertina fashion as shown in Figure 2 (described below). The dividers 8 are sized such that significant gaps 11 are formed above and below the rows 9. Also, the rows 9 are aligned such that each of the channels 12 are positioned in line with the respective channels 12 in the other rows 9.

[0033] On the inner faces 13 of the dividers 8 are located foam panels 14 which are deformable so as to receive and hold an object placed between opposing foam panels 14.

[0034] Each of the top flap 6 and the abutment 5 are provided with a plurality of holes 15, intended to receive (for example) the pins 16 of the large fluorescent tube 2.

These holes 15 provide a useful locating feature which allows a predetermined number of objects to be inserted, with appropriately selected spacing between them. Also, when the apparatus 1 is closed, the holes 15 can prevent unwanted movement of the objects within.

[0035] In use, someone wishing to insert a large fluorescent tube 2 will (if the box 4 is initially closed) open the front flaps 7, and optionally the top flap 6 as well. The large fluorescent tube 2 can then be pushed into the box 4 such that it locates in three corresponding channels 12 as illustrated. Optionally, the large fluorescent tube 2 can be positioned at a predetermined location by placing the pins at the lower end (not visible) into one of the holes 15 in the abutment. To remove the large fluorescent tube 2 the procedure is reversed

[0036] If someone wished to insert a small fluorescent tube 3, which is shorter than the distance between two of the rows 9, it can be inserted into a single row 9. In such a situation the advantage of having discrete rows 9 of channels 12 is clear. Despite the small fluorescent tube 3 being significantly shorter than the length of the box 4, it is still highly visible and easily retrievable, while being securely held by the deformable foam panels 14. This is also advantageous even with the large fluorescent tube 2 where the bulk of it is available for viewing and extraction.

[0037] Figure 2 to Figure 5 illustrate the formation of channels 12 using dividers 8 constructed by appropriate folding of a single sheet of material 10. The sheet 10 is folded in a concertina fashion, each divider 8 significantly narrower than the channels 12 formed between them. A gap 17 is formed which allows the dividers 8 a certain level of deformity which aids in the insertion of objects.

[0038] In Figure 2 the dividers 8 extend substantially perpendicularly with respect to the back of the box 4. The foam panels 14 extend the full length of the dividers 8, and as such the full depth of the box 4 can be used for storage.

[0039] In Figure 3, the dividers 8 are tapered away from the back of the box 4. The foam panels 14 extend only part of the full length of the dividers 8. The taper makes these dividers 8 suitable for retaining smaller objects at the back and larger objects at the front. It also allows easier insertion of objects as the channel 12 decreases in size from a larger width down to a suitable width at which the foam panels 14 begin to grip the object.

[0040] Although still removable from above, this design perhaps lends itself more to removal of objects from the front of the storage apparatus 1.

[0041] In a similar alternative embodiment (not shown) the dividers taper in the opposite direction, i.e. wider at the front tapering down to narrower at the back.

[0042] In Figure 4, the foam panels 14 are shaped in an almost sinusoidal cross section. Having foam panels 14 with such corresponding undulations at both sides creates cavities 18 into which objects can more easily locate. The physical benefits are that the dividers 8 can be placed closer together, while reducing the actual force

exerted on the objects by the foam panels 14. It also aids in removal of the objects from above.

[0043] Figure 5 illustrates a more severe profile than the foam panels 14 of Figure 4. In this embodiment the foam panels 14 have a sawtooth cross section. Cavities 18 are again formed by corresponding opposing foam panels 14, however significant partitioning of the cavities 18 and hence objects is achieved by the cooperation of the extreme parts of the foam panels 14.

[0044] The foam used can vary from very deformable, as may be the case for the embodiment in Figure 1, to only slightly deformable, as may be the case for the embodiment in Figure 4 and Figure 5 where the shape of the foam panels 14 lend themselves to retaining an object with less dependence on the material conforming to the shape of the object.

[0045] Figure 6 illustrates a further practical embodiment of the invention. Replacing the box of the previous embodiment is a resilient support structure 19 formed from a single sheet of strong material, such as a sheet of aluminium. The two sides 20 of the sheet are folded perpendicularly to the central section 21 of the sheet, and there are no front flaps or upper lid for closing the storage apparatus. This is therefore an open design, less suitable for transportation but more suitable for practical deployment. The bottom end of the sheet is also folded up to be perpendicular and form an abutment 22 to help locate objects such as the fluorescent tubes shown.

[0046] Again, the storage apparatus 1 has three rows of dividers and hence channels for locating fluorescent tubes.

[0047] One such practical deployment (illustrated) is the incorporation of the resilient support structure 19 onto a ladder 23. In use someone may preload the apparatus with a number of fluorescent tubes of various sized. The ladder 23 can be moved about with the aid of wheels 24, which reduces the burden on the person replacing faulty fluorescent tubes. Advantageously, replacement fluorescent tubes can be extracted from above and so the person need not descend the ladder to fetch them. This has an obvious safety benefit as the person does not need to ascend the ladder with a tube in hand.

[0048] Figure 7 shows how the channels 12 illustrated in Figure 2 to Figure 5 can be used to retain even smaller objects than fluorescent tubes. In this case the channel is retaining an energy saving lightbulb 25. The advantage of this way of storing such bulbs is that the fitting 26 is projected upwards and so someone at the top of the ladder 23 in Figure 6 can quickly select the appropriate bulb (e.g. bayonet or screw fitting).

[0049] Figure 8 illustrates another advantage of the invention. The discrete nature of the rows 9 of dividers 8 and channels 12 means that objects can be stored which are larger overall than the channels 12 themselves. Shown is a large fluorescent ring 27 of which opposite sides 28 are being held by separate channels 12. Note that if the distance between any two channels 12 is not suitable, the ring 27 can be inserted at an angle (i.e. one

side further in than the other) so as to fit within the constraints imposed by the channel 12 locations.

[0050] Figure 9 illustrates the invention in use in a practical situation where many of the advantages thereof are taken advantage of. A large fluorescent tube 2 is stored, gripped in three channels 12, and suitable for extraction from the top or from the front of the box 4. The bottom end of the large fluorescent tube 2 is located in one of a number of holes 15 in the abutment 5 at the bottom of the box 4.

[0051] In front of the large fluorescent tube 2, and overlapping it is a large fluorescent ring 27. The fluorescent ring 27 extends between the channels 12 at the extremes of the middle row 9. In front of the fluorescent ring 27 is located a small fluorescent tube 3, held in place by only one channel 12. In the top row 9 an energy saving lightbulb 25 is located, with the fitting 26 pointed upwards so as to allow identification of the correct fitting for a particular holder.

[0052] Further modifications and improvements may be added without departing from the scope of the invention as defined by the appended claims. For example, alternative shapes of foam panels may be used, or single walled dividers adopted.

Claims

1. A fluorescent tube storage apparatus (1) comprising a plurality of channels (12), the channels (12) arranged in at least one row (9), wherein the channels (12) are adapted so as to removably retain a fluorescent tube (2,3,25,27).
2. A storage apparatus (1) as claimed in claim 1 wherein, the storage apparatus (1) further comprises a plurality of dividers (8).
3. A storage apparatus (1) as claimed in claim 2 wherein, opposing faces (13) of adjacent dividers (8) form the channels (12).
4. A storage apparatus (1) as claimed in claim 2 or claim 3 wherein, the dividers (8) are at least partially deformable.
5. A storage apparatus (1) as claimed in any of claims 2 to 4 wherein, the dividers (8) comprise deformable grip portions (14).
6. A storage apparatus (1) as claimed in claim 5 wherein, the grip portions (14) comprise a deformable material which has a bias towards its original shape.
7. A storage apparatus (1) as claimed in claim 5 or claim 6 wherein, the grip portions (14) are shaped so as to improve hold.

8. A storage apparatus as claimed in any of claims 5 to 7 wherein, the dividers (8) and deformable grip portions (14) are sized such that the channels (12) are smaller than the object (2,3,25,27) to be retained.
9. A storage apparatus (1) as claimed in any of claims 2 to 8 wherein, the storage apparatus (1) further comprises a support structure (19), the support structure (19) adapted to fixedly locate the at least one row of channels (12). 5
10. A storage apparatus (1) as claimed in claim 9 wherein, the support structure (19) aligns the channels of the at least one row (9) of channels (12). 10
11. A storage apparatus (1) as claimed in claim 9 or claim 10 wherein, the support structure (19) comprises mounting means. 15
12. A storage apparatus (1) as claimed in any previous claim wherein, the channels (12) are substantially u-shaped in cross section. 20
13. A storage apparatus (1) as claimed in any of claims 2 to 12 wherein, each divider (8) is formed by two coextending surfaces, joined at at least one end and having a gap (17) therebetween. 25
14. A storage apparatus (1) as claimed in claim 13 wherein, the two coextending surfaces are substantially parallel. 30
15. A storage apparatus (1) as claimed in claim 13 wherein, the two coextending surfaces extend so as to form a tapered divider (8). 35
16. A storage apparatus (1) as claimed in any of claims 2 to 15 wherein, each of the at least one row is formed from a single piece of sheet material (10), adapted to form the dividers (8). 40
17. A storage apparatus (1) as claimed in any of claims 9 to 16 wherein, the support structure (19) is comprised of a sheet material. 45
18. A storage apparatus (1) as claimed in any of claims 9 to 17 wherein, the support structure (19) comprises a top and a bottom end, the top end open and the bottom end having an abutment (5). 50
19. A storage apparatus (1) as claimed in claim 18 wherein, the abutment (5) prevents movement of objects (2,3,25,27) located within the storage apparatus (1) beyond a predetermined limit. 55
20. A storage apparatus (1) as claimed in claim 18 or claim 19 wherein, the top end has a closable lid (6).
21. A storage apparatus (1) as claimed in any of claims 18 to 20 wherein, the top end is closed.
22. A storage apparatus (1) as claimed in any of claims 9 to 21 wherein, the support structure (19) substantially takes the form of a box (4), the at least one row (9) located therein.
23. A storage apparatus (1) as claimed in claim 22 wherein, the box (4) comprises carry straps.

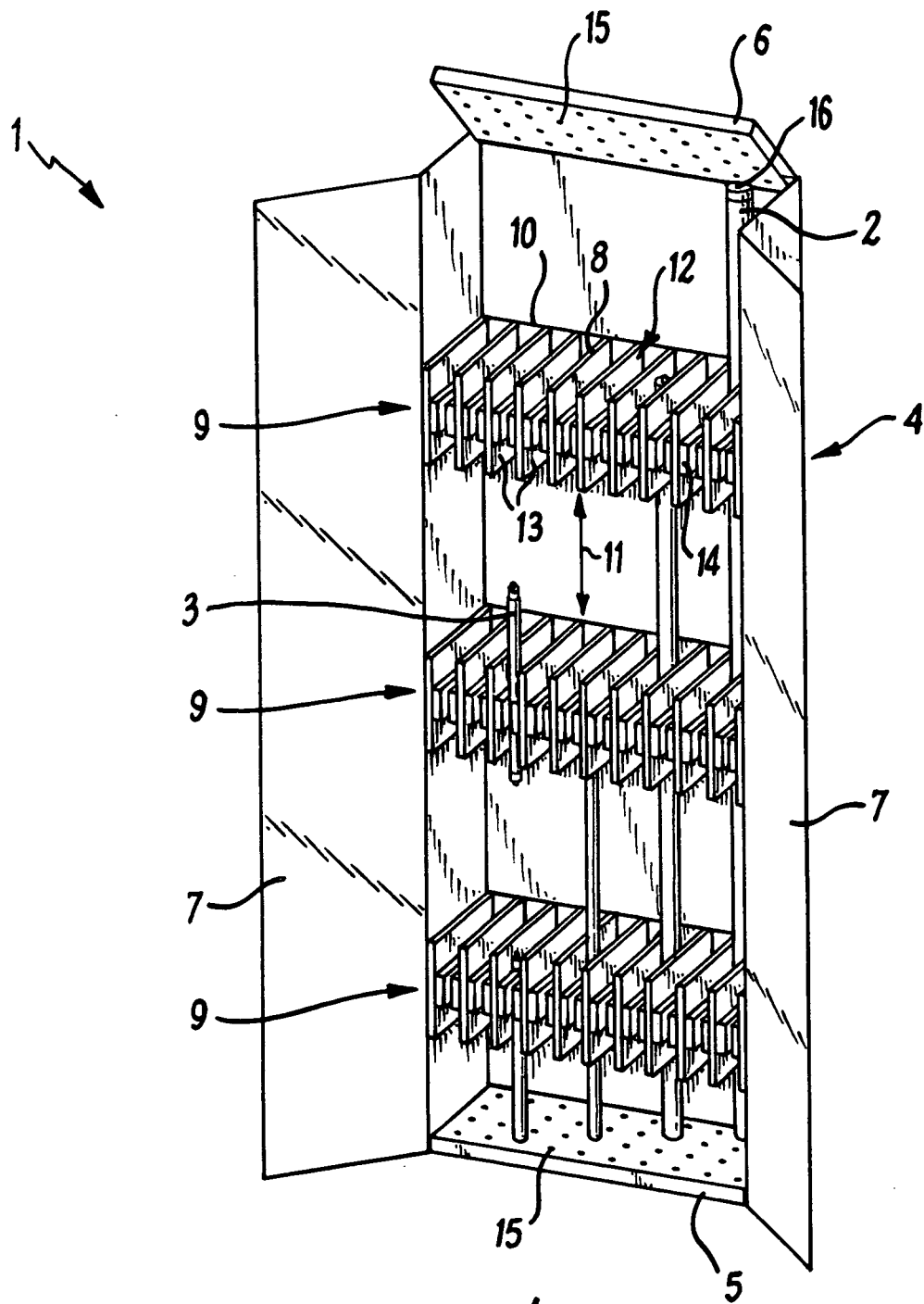


FIG. 1

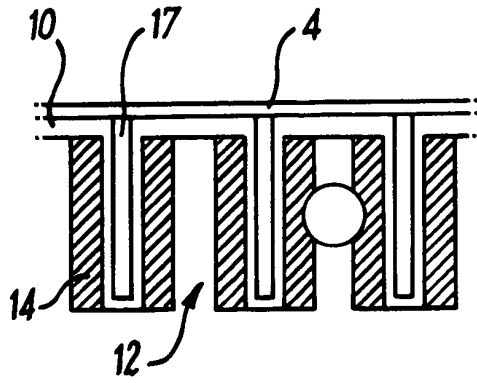


Fig. 2

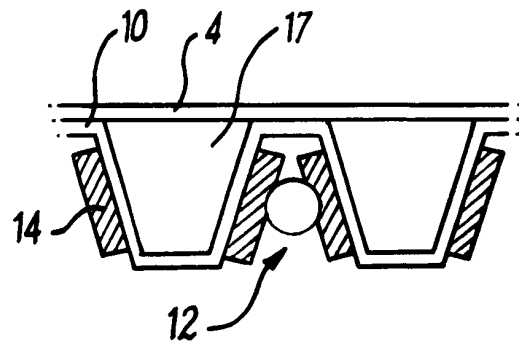


Fig. 3

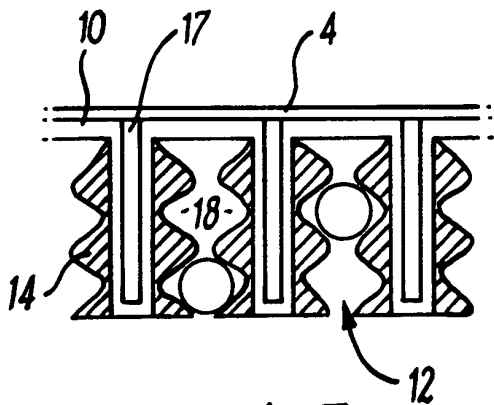


Fig. 4

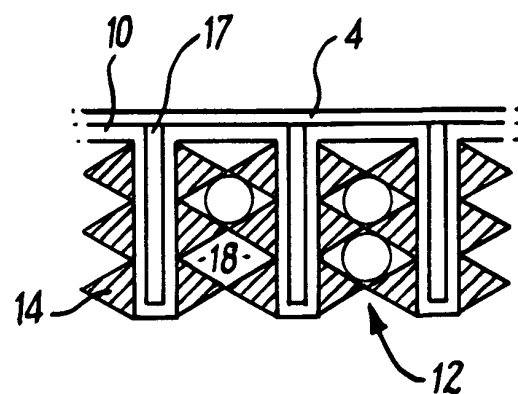


Fig. 5

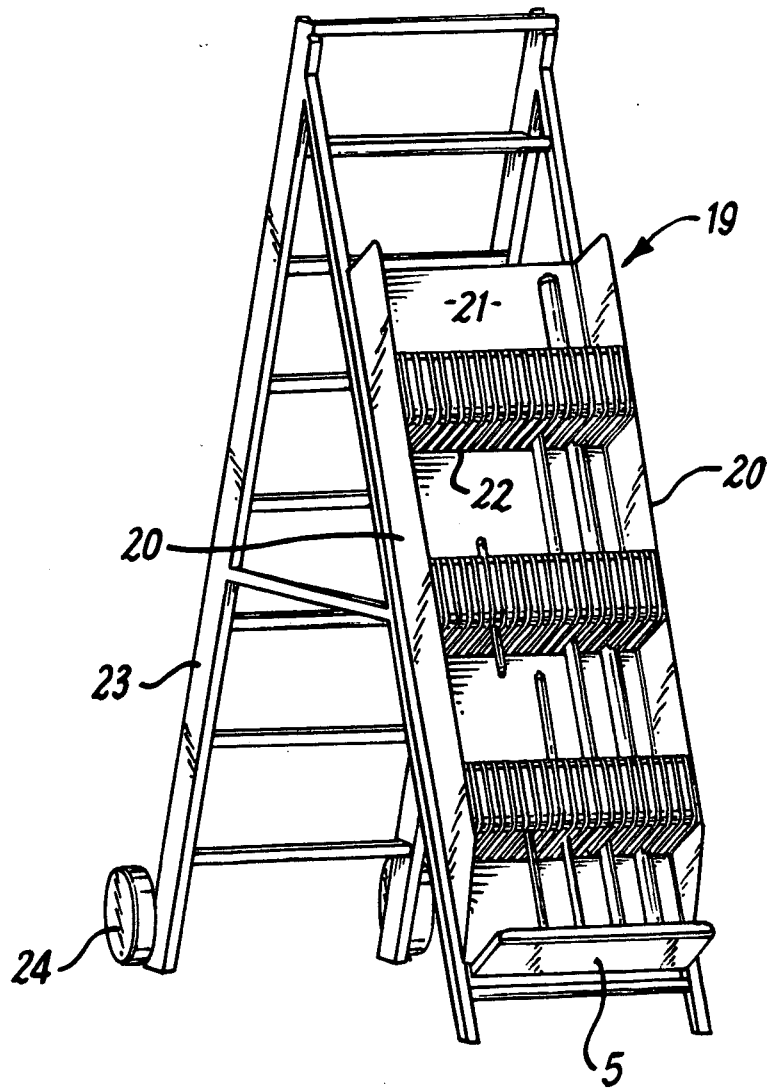


Fig. 6

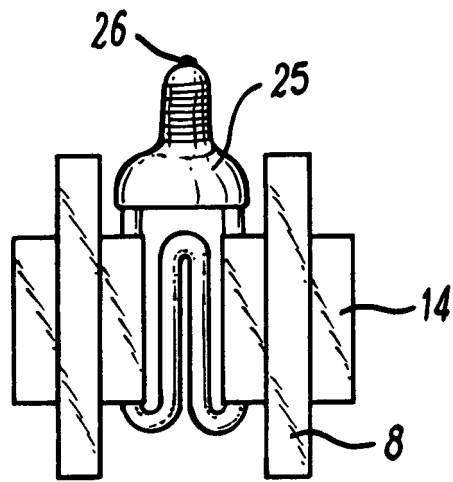


Fig. 7

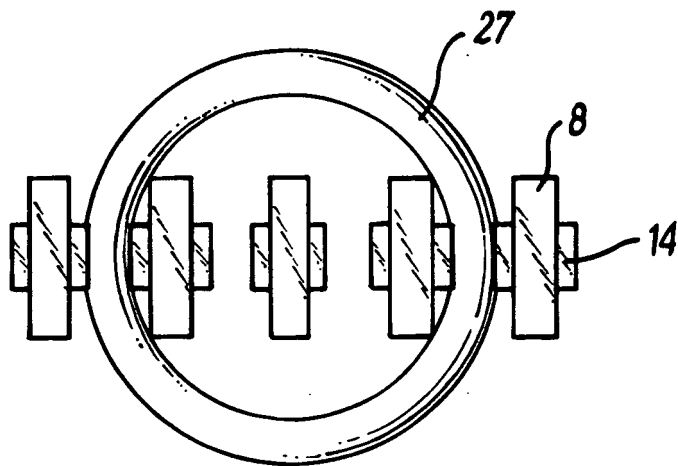


Fig. 8

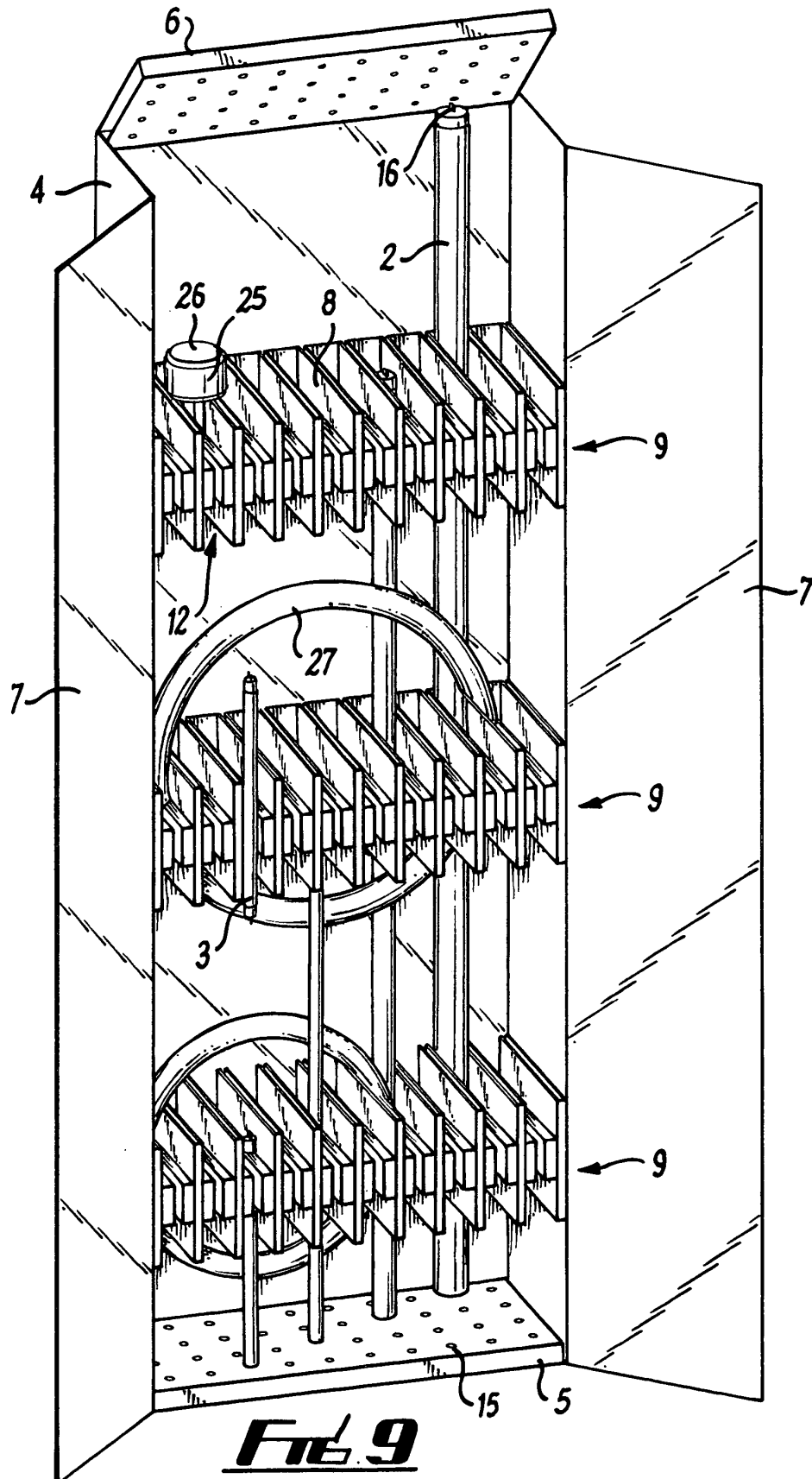


Fig. 9