This invention relates generally to fire extinguishers and more particularly to portable type dry chemical fire extinguishers in which a cartridge containing compressed gas is used to charge the extinguisher. In a dry chemical fire extinguisher of this type, a cylindrical tank is usually provided which contains a dry chemical, free-flowing powder together with a cooperating cartridge member containing a compressed inert gas such as carbon dioxide or nitrogen. When the extinguisher is to be operated, suitable valve means are actuated to interconnect the gas cartridge with the interior of the tank so that the compressed gas will force the dry chemical extinguisher composition through a suitable outlet hose.

Under certain conditions, it is advantageous to mount the cartridge member exteriorly of the tank. (As used here and throughout the application, the term “exteriorly” having respect to the cartridge member means outside of the powder chamber.) With such an arrangement, the cartridge may readily be replaced with a new cartridge without having to disassemble the complete extinguisher. Further, extinguishers with exteriorly mounted cartridges overcome the problem of having to push the cartridge into the powder as is the case with extinguishers incorporating an internally mounted cartridge.

With presently known exteriorly mounted cartridge designs, however, the outlet hose tends to become packed with powder during intermittent operation. This result is a consequence of a shut-off valve for the powder usually being disposed at the bottom of the hose so that powder remaining in the hose tends to pack when the extinguisher is turned off.

In addition, with some types of exteriorly mounted cartridges, the cartridge itself is vulnerable to being accidentally dislodged from the tank and may detract from the compactness of the extinguisher. In addition, extensive modification of the valve head assemblies on the top of the tanks to accommodate an exteriorly mounted cartridge have been necessary. Thus, presently known exteriorly mounted cartridges, although solving certain problems, tend to create others.

With all of the foregoing in mind, it is accordingly a primary object of the present invention to provide a greatly improved exteriorly mounted cartridge type dry chemical fire extinguisher in which the foregoing problems are overcome.

More particularly, it is an object to provide a fire extinguisher in which the cartridge therefor is so mounted that it will not interfere with the normal head assembly construction and such that a cut-off valve for the hose may be disposed at the entrance portion of the outlet hose to the end that packing of powder in the hose during intermittent operation is avoided.

Another important object is to provide an extinguisher having an exteriorly mounted cartridge in which the cartridge itself, while exteriorly mountable, is substantially surrounded by and concealed from view by the tank. The result is a compact and neat appearing structure with adequate protection for the cartridge.

Still another object is to provide an improved dry chemical type fire extinguisher having an exteriorly mounted cartridge in which relatively little modification of the normal head assembly structure on the extinguisher is necessary to accommodate the improved cartridge-tank combination.

Briefly, these and many other objects and advantages of this invention are attained by providing a tank having an elongated receiving tube with an exterior entrance portion disposed at the bottom area of the tank. The tube itself extends up into the interior of the tank but is accessible from the exterior of the tank. The arrangement is such that a cartridge may be received within the elongated tube in the bottom portion of the tank so that the tank will surround and substantially eclipse from view the cartridge itself.

The upper end of the elongated tube terminates in a valve head assembly for coupling to the upper end of the cartridge. The cartridge contents are placed into communication with the interior of the tank by means of an elongated push rod which may be actuated by the normal plunger mechanism at the upper head assembly on the tank. Thus, relatively little modification of existing structure is necessary and yet the advantages of an exteriorly mounted cartridge are realized.

A better understanding of the invention will be had by now referring to the accompanying drawings, in which:

FIGURE 1 is an elevational view partly in cross-section illustrating a first embodiment of the extinguisher of this invention.

FIGURE 2 is an enlarged fragmentary cross-section of a portion of the structure illustrated in FIGURE 1 and.

FIGURE 3 is another view partly in cross-section illustrating a second embodiment of the invention.

Referring first to FIGURE 1, there is illustrated an extinguisher tank 10 provided with a head assembly 11 including an operating lever 12 and outlet hose 13, the latter two elements being indicated in dotted lines. As shown, there is provided a CO₂ cartridge 14 receivable in a bottom exterior entrance opening 15 and cooperating elongated receiving tube 16 extending upwardly into the tank 10. The elongated receiving tube 16 terminates at its upper end in a valve head structure 17 including an internally threaded portion 18 for threaded connection to the upper end of the cartridge 14.

In order to place the contents of the cartridge 14 into communication with the interior of the tank to charge the extinguisher, there is provided an actuating mechanism including the conventional type plunger 19 arranged to be downwardly urged by the lever 12. The plunger 19 engages a cup-shaped member 20 adapted to slide downwardly and urge a push rod 21 through an elongated guide tube 22. The guide tube 22 is supported by a collar structure 23 and flange 24 secured to an interior portion of the head assembly 11. In order to permit the member 20 to telescope downwardly over the collar 23, a slot (not shown) may be provided in the member 20 to accommodate the flange 24.

The lower end of the push rod 21 terminates in a punch 25 adapted to rupture a diaphragm into the upper portion of the cartridge 14 to release the gas into the threaded area of the valve head assembly 17 and to the interior of the tank. When the compressed gas from the cartridge 14 is released to the interior of the tank 10, dry chemical powder (not shown) will be forced up a powder tube 26 secured at its upper end to the head assembly 11 and communicating with the internal chamber 27 within the head assembly. A simple actuating valve head 28 secured to the plunger 19 will move downwardly with the plunger when the push rod is actuated so as to provide communication between the chamber 27 and the outlet hose 13.

Thus, powder urged up through the powder tube 26 will pass through the outlet hose 13.

It should be noted with the foregoing construction, that
when the extinguisher is shut off, the valve head 28 will close within the valve head assembly 11, thus preventing further powder from entering the outlet hose 13. Thus powder will not become packed within the hose 13 as is the case when the shut-off valve is located at the far end or outlet end of the hose.

Referring particularly to FIGURE 2, details of the valve head assembly 17 to which the upper end of the cartridge 14 is secured are shown. Thus, the lower punch or puncture pin portion 25 of the push rod 21 includes openings 29 through which compressed gas passing into the lower portion may communicate into a chamber within the valve head assembly 17. Lateral passages 31 and 32 in turn extend from the chamber 30 immediately above the threaded portion 18 towards the interior of the tank. Flap elements such as indicated by the cup-shaped rubber flap 33 normally close off the outlet ends of the passages 31 and 32. However, these flap elements will be urged upwardly by compressed gas away from the exit ends of the passages 31 and 32 so that gas can fill the interior of the extinguisher. The upper end of the flap elements is supported as by a collar 34 to the guide tube 22.

In the embodiment described in FIGURES 1 and 2, the powder tube 26 as stated with respect to FIGURE 1 is secured to the head assembly 11. Therefore, when the head assembly 11 is removed, the powder tube 26 is removed with the head assembly. When it is desired to reinsert the head assembly into the tank 10, in order to protect the flap elements 33, there is provided a conical shield 35 as shown in both FIGURES 1 and 2. Thus the end of the powder tube 26 will be deflected from possibly damaging the rubber flap element 33 when the head assembly is positioned on the tank 10.

FIGURE 3 shows a modified form of the invention wherein the powder tube is permanently retained in position so that the head assembly may be removed independently of the powder tube. In FIGURE 3, there is shown a tank 36 including a head assembly 37 and operating lever 38 together with outlet hose 39. At the lower portion of the tank 36 there is provided an inverted cup-shaped bottom structure 40 normally braced to the lower end of the tank 36 and serving to close off the lower end. The cup-shaped structure 40 includes an elongated receiving tube 41 similar to the tube 16 described in FIGURE 1. As shown, the tube 41 includes a head valve structure 42 including internal threads 43 for threadedly receiving the upper end of the cartridge 14. Furthermore, as previously illustrated in FIGURE 1 is provided at 44 for operating a push rod cap 45 engaging a push rod 46 within a guide tube 47.

Rather than have the guide tube 47 secured to the head assembly, however, there is provided a collar connection 48 and support 49 connected to the powder tube 50. The powder tube 50 itself is directly secured as by brazing to the elongated receiving tube 41 as indicated at 51 and 52. The upper end of the powder tube terminates in an opening 53 adapted to be received within an annular entrance opening 54 formed in the head assembly 37. The arrangement is such that the head assembly may be removed without affecting the powder tube 50.

The lower end of the powder tube 50 wraps about the elongated tube 41 and opens out at 44. An additional opening 56 may be provided on the diametrically opposite side as indicated, and also in the wrapped portion as such (not shown).

The operation of the structure of FIGURE 3 is similar to that of FIGURE 1. Thus, there is provided a flap element 57 disposed on the valve head structure 42 and this flap element is raised when pressure from the cartridge 14 passes through lateral channels in the head structure similar to the channels 31 and 32 of FIGURE 1 so that the powder tube 50 is secured directly to the elongated receiving tube 41 so that the head assembly 37 may be removed independently of the powder tube, there is no necessity for a conical shield such as the shield 35 shown in FIGURE 1.

An advantage in structure illustrated in FIGURE 3 is the fact that the lower end of the powder tube may be disposed closer to the bottom portion of the tank so that maximum powder or other chemical (not shown) in the tank will be used. Further, with the powder tube 50 secured directly to the elongated receiving tube 41, the entire structure may be assembled as a unit by inserting the inverted cup 40 in the bottom of the tank 36. Thus, assembly and disassembly of the structure is somewhat simpler when the valve tube constitutes a part of the head assembly and must be carefully guided through the top opening in the tank 10.

From the foregoing description, it will be evident that the present invention has accordingly provided a greatly improved fire extinguisher device. Not only are the advantages of exterior mounting of the cartridge realizable since the cartridge is readily insertable into the bottom of the extinguisher from the exterior, but in addition, the cartridge itself, in view of the geometry, is completely surrounded by the tank and essentially invisible from view. Thus it is not only properly protected, but the entire structure is relatively compact.

Moreover, as mentioned heretofore, the normal type valve structure for the head assembly on the tank extinguisher may be employed so that cut-off of the powder will occur at the entrance to the outlet hose such as the hose 13 in FIGURE 1 or the hose 39 in FIGURE 3. Powder packing in the hose is thus avoided. In those prior structures in which the cartridge assembly effected communication to the interior of the extinguisher through the head assembly, the valving was complicated to the extent that shut-off valves were normally provided at the end of the hose. By mounting the cartridge on the bottom as described, these complications are avoided.

Finally, it will be evident that relatively little modification is required of the conventional type dry chemical extinguishers. Thus, the plunger 44 in FIGURE 3 or 19 in FIGURE 1 may simply be formed as a solid plunger rather than the usual hollow plunger with holes and a punch at its end for rupturing the normally provided internal type cartridges. As described, this plunger merely bears against the top cup of the push rod, there being no rigid connection thereto so that disassembly is very easy.

While only two particular embodiments of the invention have been set forth and described, minor modifications fail to change the scope and spirit of this invention will occur to those skilled in the art. The extinguisher is therefore not to be thought of as limited to the exact embodiments set forth merely for illustrative purposes.

What is claimed is:

1. A dry chemical fire extinguisher, comprising, in combination: a tank having an elongated receiving tube, said tube having an exterior entrance portion disposed at the bottom area of said tank and terminating at its upper end in a valve head structure for communicating with the interior of said tank; a cartridge receivable into said tube with its upper end coupled to said valve head structure; and actuating means operable from the upper end of said tank for placing the interior of said cartridge into communication with the interior of said tank, said actuating means including an elongated push rod extending downwardly from the upper interior of said tank into said valve head structure, the lower end of said push rod being in a punch adapted to rupture the upper end of said cartridge upon downward movement so that gas under pressure from said cartridge is released through said valve head structure into the interior of said tank.

2. An extinguisher according to claim 1, including an outlet port in its upper end, said outlet port being placed into communication with an outlet hose for said tank upon operation of said actuating means and its lower end terminating in an opening adjacent to the lower in-
terior portion of said tank whereby compressed gas from said cartridge forces chemicals up through said powder tube to the outlet hose of said tank.

3. An extinguisher according to claim 2, in which said valve head structure includes an internally threaded entrance portion for threadedly receiving the upper end of said cartridge, said push rod extending co-axially through said entrance portion; lateral passages communicating with said entrance portion above said threads; and flap elements normally closing said passages, said flap elements being pushed open when gas from said cartridge passes through said passages.

4. An extinguisher according to claim 3, in which said actuating means includes a head assembly on said tank from which said outlet hose extends, said powder tube being secured to said head assembly and removable with said head assembly from said tank, said valve head structure including a conically shaped shield above said flap elements.

5. An extinguisher according to claim 3, in which said actuating means includes a head assembly on said tank including an entrance passage adapted to communicate with said outlet hose when said actuating means is operated, said powder tube being secured to said elongated receiving tube and having its upper end receivable in said entrance passage when said head assembly is positioned on said tank.

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