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OPENING DEVICE FOR FLUID CONTAINERS

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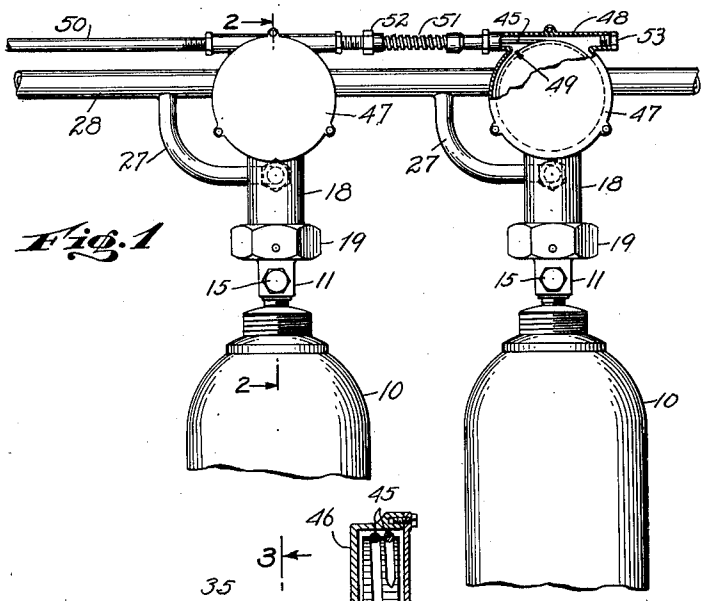

Fig. 1

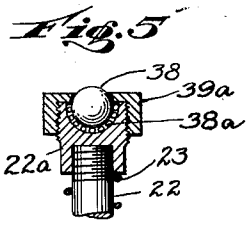

Fig. 5

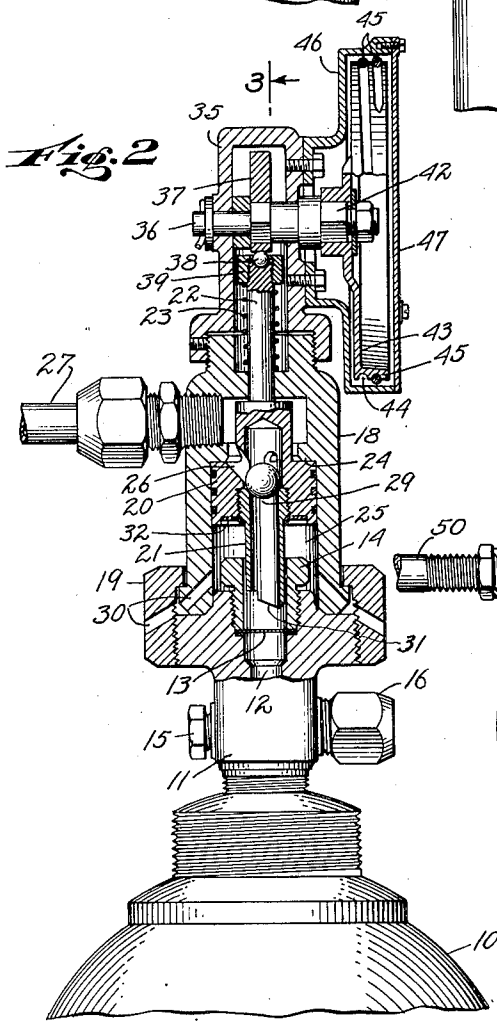

Fig. 2

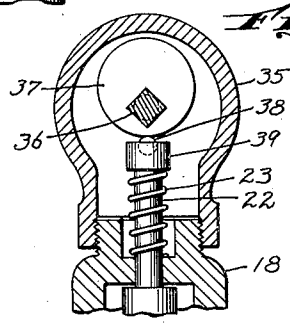

Fig. 3

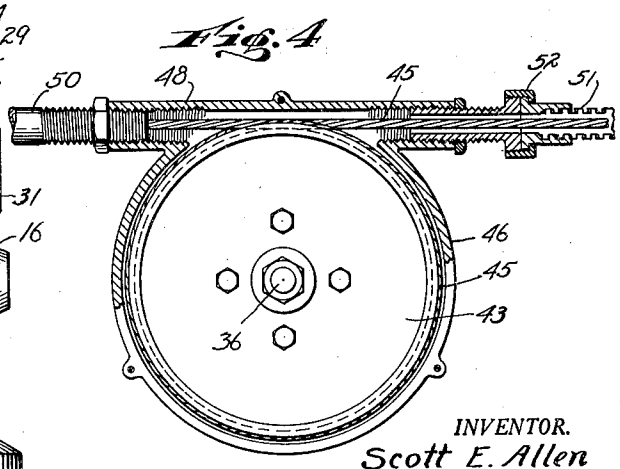

Fig. 4

INVENTOR.
Scott E. Allen

BY
Frederick S. Duncan ATTORNEY.

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OPENING DEVICE FOR FLUID CONTAINERS

Scott E. Allen, East Orange, N. J., assignor to C-O-Two Fire Equipment Company, Newark, N. J., a corporation of Delaware

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11 Claims. (Cl. 169—11)

The present invention relates to apparatus for releasing fluids from containers. The invention is particularly adapted for containers holding highly compressed fluids such, for example, as liquefied carbon dioxide, and has for an object to provide improved means for opening the container to effect the discharge of the fluid.

Ordinarily cylinders of carbon dioxide are closed by a sealing disk which must be ruptured to release the fluid and the prior art discloses various means for forcing a puncturing member through the sealing disk.

The present invention is an improvement on that disclosed in Patent No. 1,782,020, issued November 18, 1930, wherein the puncturing element is depressed by a rotary cam. The cam has a sheave wheel connected thereto about which a rope is wound so that by pulling the rope the cam will be rotated, depressing the punch which ruptures the disc. The apparatus disclosed in said patent is adapted for use with a single fluid container only and it is an object of the present invention to provide means whereby simultaneous discharge of a plurality of containers may be effected.

Since considerable effort may be required to rupture simultaneously the discs of a battery of containers, it is desirable to reduce friction as much as possible in the operating parts and it is a specific object of the present invention to provide anti-friction engagement between the operating cam and the pucturing member.

In a copending application Serial No. 349,150, filed March 22, 1929, means are provided whereby the fluid discharging from the container assists in operating the puncturing member. Thus, as soon as any fluid is released by partial initial rupture of the disk it passes up through the puncturing member and exerts pressure on the top of the plunger carried by said member helping to force the plunger downward to complete the rupturing of the disk. Furthermore the punch is held down during discharge, in such position that the fluid must pass therethrough to a discharge line and leakage about the plunger is prevented. It is an object of the present invention to incorporate this principle in a cam operated puncturing apparatus so as to still further reduce the effort required to effect the discharge of the battery of containers.

A more specific object of the invention is to provide a housing for each sheave wheel having two-way ports so that the rope may enter one of the ports and be wrapped around the sheave and may pass out through the other port to the next sheave in the series.

Another object of the invention is to provide a flexible casing between the sheave housings through which the rope may pass so as to guard against accidental pulling of the rope.

The object of having the casing flexible is to allow for slight variations in alinement of the series of containers.

With these and other objects in view which will appear hereinafter I shall now describe a preferred embodiment of my invention and thereafter shall point out the novelty and scope of the invention in the claims.

In the accompanying drawing:

Figure 1 illustrates a battery of two fluid containers (fragmentally shown), each equipped with my improved discharge mechanism, the two mechanisms being connected for operation by a single pull rope;

Fig. 2 is a view, largely in section, of one of the discharge heads, the section being taken on the line 2—2 of Fig. 1;

Fig. 3 is a detail view in section of a portion of a discharge head, the section being taken on the line 3—3 of Fig. 2;

Fig. 4 is a side view partly in section of one of the sheave wheels in its housing with the lid of the housing removed; and

Fig. 5 is a detail view in vertical section of a modified form of anti-friction connection between the operating cam and the puncturing means.

Referring first to Fig. 1 a pair of cylinders 10—10 are shown, each fitted with a discharge head. Each discharge head comprises a body member 11 which is threaded into the neck of the cylinder. This body member is formed with a discharge bore 12 which is normally closed by sealing disk 13 secured against a seat in the bore by a tubular plug 14. Below the sealing disk the body may be provided with the customary safety plug 15 and filling fixture 16.

The discharge head also includes a cylinder member 18 coupled to the body member by a ring nut 19. A plunger 20 is fitted to slide in the cylinder member and carries a tubular cutter or punch 21. The plunger is formed with an upwardly projecting stem 22 which passes out through the cylinder member. A spring 23 acting on this stem normally holds the plunger in the raised position shown in Fig. 2 with the plunger bearing against an annular shoulder 24 at the top of the working chamber 25 of the cylinder member. By depressing the plunger the

tubular cutter is forced through the sealing disk 13 so that fluid from the chamber 10 will then pass upward through the tubular punch and thence through lateral ports 26 to the upper side of the plunger.

The fluid after passing to the upper side of the plunger passes out through a branch discharge line 27 to the main delivery line 28. A ball check valve 29 is provided at the top of the punch 21, opening toward the discharge line 27. The purpose of the check valve will be explained hereinafter. Pressure of the fluid on the top of the plunger assists in forcing the plunger downward, and to prevent air banking under the plunger, vents 30 are provided in the cylinder 18 and nut 19.

The cutting edge 31 of the punch is beveled inwardly or toward the bore of the punch so that when the latter is forced through the sealing disk 13 it will cut an opening therein of smaller diameter than the outside diameter of the punch, with the result that the uncut portion of the disc will jam tightly against the body of the punch and form an effective seal. However, in order to provide a double assurance against any possibility of leakage into the working chamber below the plunger, a gasket 32 is provided on the bottom of the plunger which, when the plunger is completely depressed, will seat against the top of the plug 14.

Secured to the top of the cylinder member is a casing 35 which encloses the projecting stem 22 of the plunger and provides bearings for a transverse shaft 36 above said stem. A cam 37 in the form of a disc eccentrically mounted and fixed on a squared portion of the shaft 36 bears against a ball 38 which is supported in a socket at the top of the stem, being retained in said socket by a keeper 39 threaded upon said stem. This keeper provides an abutment for the upper end of the spring 23.

Fixed upon a squared portion 42 of the shaft 36 outside of the casing is a sheave wheel 43. The rim of this sheave wheel is provided with a spiral groove 44 to receive a pull cord or rope 45. A housing 46 for the sheave wheel is bolted to the casing 35. The outer end wall of this housing is in the form of a detachable lid 47. The inside diameter of the housing is just sufficient to clear the rope seated in the groove 44 and will prevent the rope from slipping laterally out of the groove.

The housing 46 is provided at the top with a tangential tubular guide 48 for the rope. As clearly shown in Fig. 4 the rope enters this guide and is passed once around the sheave wheel and then passes out the opposite end of the tubular guide, whence it runs to the sheave wheel of the next discharge head. After passing about the sheave wheels of a series of discharge heads its end is finally secured to the sheave wheel of the last discharge head of the series as shown at 49 in Fig. 1.

It will be evident that by this arrangement a single pull cord or rope may be used to effect the discharge of a plurality of cylinders, the entire series of operating cams 37 being actuated simultaneously to depress the cutters 21 and rupture the cylinder disks 13. If, for any reason, it be desired to discharge the cylinders by fluid means this may be done by introducing fluid under pressure into the main line 28 and because of the ball check 29 at the top of each punch the pressure will be confined to the upper side of each plunger forcing the plunger down to rupture the disk 13. On pulling the rope 45 it is merely necessary to partly cut one or more of the disks 13 whereupon the fluid escaping from the cylinder will act upon the upper side of the plunger to complete the puncturing of the disk and also will exert a pressure by way of the branch pipes 27 and main line 28 to the rest of the discharge heads, insuring depression of the cutters in said heads and thus effecting the discharge of all of the cylinders in the series. Because of the ball-bearing between the cam 37 and the stem 22 of each discharge head the energy required to operate each head is reduced to a minimum and a large number of discharge heads may be actuated simultaneously without requiring the exercise of an undue amount of effort.

A slight modification of the ball-bearing structure is shown in Fig. 5. The ball 38 is supported on a plurality of much smaller balls 38*a* which are held in a cup member 22*a* fixed to the end of the stem 22. A keeper 39*a* serves to hold the large ball 38 and smaller balls 38*a* in place.

In order to prevent the entrance of dirt into the housing 46 a tubular casing 50 is fitted over the pull cord 45, this being suitably connected to the tubular guide 48. Because the various cylinders may not be in perfect alinement it is preferable to provide a flexible casing 51 between successive guides 48. A suitable coupling indicated at 52 in Fig. 1 may be used in effecting the connection of the flexible casing to the tubular guide 45. The unused end of the tubular guide in the last discharge head of the series may be closed by a screw plug 53.

While I have described a preferred embodiment of my invention it will be understood that this is to be taken as illustrative and not limitative and that I reserve the right to make such changes in form, construction and arrangement of parts as may fall within the spirit and scope of the following claims.

I claim:

1. A device for opening a fluid container, comprising an opening member, means including a pulley for operating said member, a pull cord wrapped around the pulley, and a housing for the pulley, said housing having opposed inlet and outlet openings for the cord.

2. A device for opening a fluid container, comprising an opening member, means including a pulley for operating said member, a pull cord wrapped around the pulley, a housing for the pulley, and a tangential guide tube connected with the housing and providing a port through which the cord may be admitted to the pulley and an opposed port through which the cord may be led out from the pulley.

3. A device for opening a fluid container, comprising an opening member, means including a pulley for operating said member, said pulley being provided with a spiral peripheral groove, a pull cord wrapped around the pulley in the groove, and a housing fitting over the pulley so closely as to prevent the cord from slipping laterally out of the groove, the housing being provided with opposed inlet and outlet ports for the cord.

4. An apparatus for effecting substantially simultaneous opening of a series of fluid containers, comprising an opening member for each container, a rotary cam for operating each member, a pulley fixed to each cam, a common pull cord for the pulleys, and a housing for each pulley provided with an inlet port and an outlet port for the cord.

5. An apparatus for effecting substantially si-

multaneous opening of a series of fluid containers, comprising an opening member for each container, a rotary cam for operating each member, a pulley fixed to each cam, a common pull cord for the pulleys, a housing for each pulley provided with an inlet port and an outlet port for the cord, and a flexible casing for the cord between adjacent housings.

6. An apparatus for effecting substantially simultaneous opening of a series of fluid containers, comprising an opening member for each container, a rotary cam for operating each member, a pulley fixed to each cam, means for rotating the pulleys from a remote point, said means comprising a pull cord extending from said point and wrapped about said pulleys serially, and a housing for the cord and pulleys extending from said point and including a flexible section between successive pulleys.

7. An apparatus for effecting substantially simultaneous opening of a series of fluid containers, comprising an opening member for each container, means for operating each member including a rotary cam and an anti-friction bearing between the cam and the member, a pulley fixed to each cam, and a common pull cord for rotating the pulleys, the cord being wrapped about said pulleys serially and being terminally secured to the last pulley of the series.

8. An apparatus for effecting substantially simultaneous opening of a series of fluid containers, comprising an opening member for each container, a rotary cam for operating each member, an anti-friction bearing between each cam and the member operated thereby, a pulley fixed to each cam, a common pull cord for rotating the pulleys, the cord being wrapped about said pulleys serially and being terminally secured to the last pulley of the series, and a housing for each pulley provided with an inlet port and an outlet port for the cord.

9. A device for opening a fluid container, comprising a body, a member slidable in the body to open the container, a disk cam mounted in the body, a ball bearing between the cam and said member whereby rotation of the cam will operate said member, a pulley within the body for operating said cam, and a pull cord wound on said pulley for rotating the same, said body being formed with inlet and outlet openings through which the cord may be led in to the pulley and out from the pulley.

10. A device for opening a fluid container, comprising an opening member, fluid pressure actuable means for operating said member, a cam, an anti-friction bearing between the cam and said member, and a pull cord for operating the cam to initiate operation of said member, said member providing a passage for leading fluid released from the container to said means to complete the operation of the opening member.

11. An apparatus for effecting substantially simultaneous opening of a series of fluid containers, comprising an opening member for each container, fluid pressure actuable means for operating each member, a rotary cam for operating each member, an anti-friction bearing between each cam and the member operated thereby, a pulley fixed to each cam, and a common pull cord for rotating the pulleys to initiate operation of the opening members, each member providing a passage for leading fluid released from the container to said means to complete the operation of the opening member.

SCOTT E. ALLEN.