Aug. 2, 1938. E. F. DELFOE 2,125,428

SPRAYING DEVICE

Filed March 20, 1936

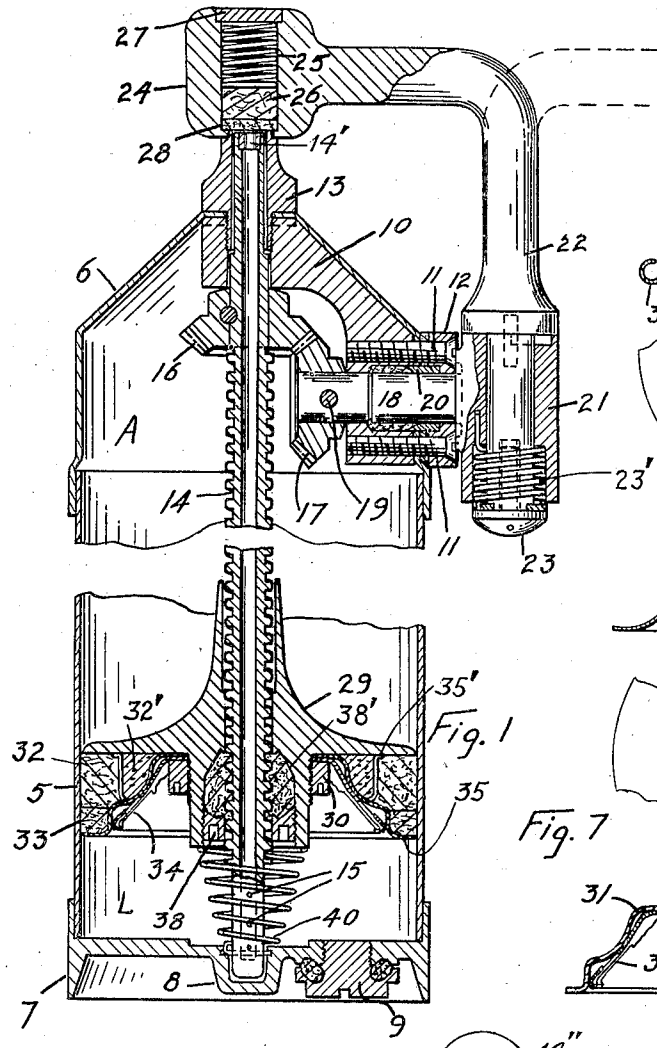

Fig. 1

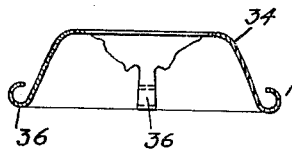

Fig. 4

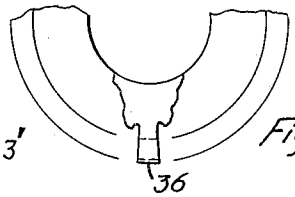

Fig. 5

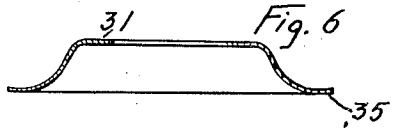

Fig. 6

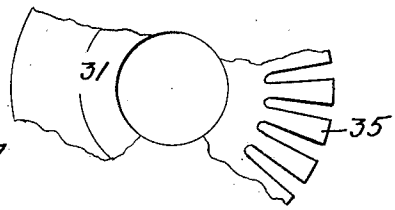

Fig. 7

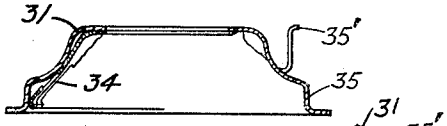

Fig. 8

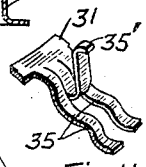

Fig. 11

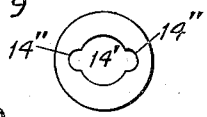

Fig. 12

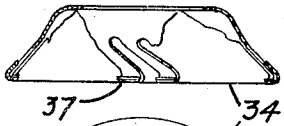

Fig. 2

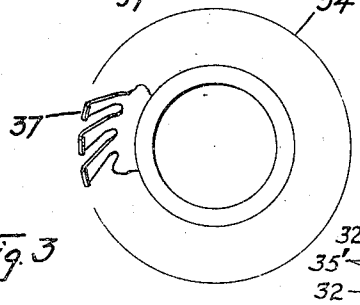

Fig. 3

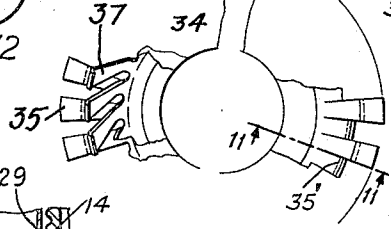

Fig. 9

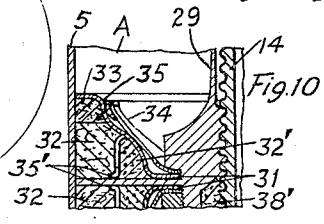

Fig. 10

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SPRAYING DEVICE

Edward F. Delfoe, Brooklyn, N. Y.

Application March 20, 1936, Serial No. 69,782

3 Claims. (Cl. 299—93)

This invention relates to spraying devices which are particularly adapted for use as fire extinguishing apparatus to eject or expel liquid or gaseous substances therefrom in a steady and continuous stream.

One of the objects of the invention is to provide a device of the above character which is portable and adapted to be operated by hand.

Another object is to provide a spraying device of such construction and material that it will hold contained liquid with negligible leakage or evaporation thereof, and also to provide a spraying device in which corrosion or other deteriorating factors will be reduced to a minimum.

Another object consists in the provision of a piston assembly which will provide a reliable and positive seal between the air and liquid chambers of the spraying device.

A further object is to provide a spraying device by which a maximum degree of steadiness and control is obtained whereby a stream will be accurately directed to a desired point or particular object.

These and further objects will be apparent from the following description when considered in connection with the accompanying drawing in which certain modifications of the invention are illustrated.

Referring to the drawing, Figure 1 is a longitudinal section of the improved device.

Fig. 2 is a sectional elevation of a pressure disk or plate which forms part of the piston assembly;

Fig. 3 is a broken-away plan view of Fig. 2;

Fig. 4 is an elevation of a disk or plate which is a modification of the plate shown in Fig. 2;

Fig. 5 is a broken-away plan view of Fig. 4;

Fig. 6 is an elevation in section of a supporting disk or plate which is positioned above and which cooperates with the pressure disk or plate;

Fig. 7 is a broken-away plan view of Fig. 6;

Fig. 8 is a sectional elevation of the assembled pressure disk and supporting disks as shown in Fig. 1, and as shown separately in Figs. 2 and 11, respectively, and

Fig. 9 is a broken-away plan view of Fig. 8.

Fig. 10 is a section showing a modification of the piston cap illustrated in Fig. 1.

Fig. 11 is a perspective view taken on the line 11, 11 of Fig. 9 and showing a disk similar to that illustrated in Fig. 1, and a modification of that shown in Fig. 6, and

Fig. 12 is a plan view of the nozzle.

In the drawing a container 5 or casing is illustrated. This container may be considered in the present case as being of cylindrical formation. It will be understood, however, that it may be equally well of other formation. Furthermore, it is desired to point out that this container is not limited in size or capacity, and it may be of such large dimensions as to require transportation on wheeled apparatus. For the sake of clearness and brevity in description and disclosure, it will be considered that the present arrangement is of the usual size, for instance, of a fire sprayer or extinguisher for use about the house, factory, automobile or other places.

The container is provided with a base 7 which may have a bearing 8 and a filling port which may be closed, as indicated, by a nut 9 about which a gasket is positioned to prevent leakage of the liquid contents of the container. The cap 6 is suitably vented and secured to the upper end of the container and forms a housing and support for a crank shaft bearing 10. The cap is so vented to permit air to enter the interior of the upper part of the container, as a piston, to be presently described, is forced downwardly. The cap vent permits the air to escape when the piston is raised to its uppermost position before refilling the container. This bearing is secured to the cap by means of screws 11, 11 which pass through a bearing plate 12 and through the walls of the cap 6 into the bearing 10. The bearing is also secured in position by means of the nozzle shield 13 which is positioned on the top of the cap 6 and has a tubular extension provided with exterior threads which engage a threaded opening in the top of the bearing 10. A piston spindle 14 extends through the bearing 10 which forms a journal therefor, and the lower end of the spindle is adapted to idle freely in the recess 8 at the bottom of the container 5. It will be understood that it is not necessary that the end of the spindle be positioned in the recess, as said spindle is held in position by the bearing 10 and a driven gear to be presently described. The spindle is hollow, and is shown in the present instance as being provided with exterior threads. These threads may extend partly or throughout the entire length of the exterior surface of the spindle. The lower end of the spindle is provided with suitable openings 15 which serve as inlets to connect the interior of the container with the interior bore of the hollow spindle through which liquid is forced, as will be presently described. The upper end of the shaft 14 is provided with an opening or nozzle 14' which is of the configuration illustrated in Fig. 12. The main portion of this opening or nozzle corre-

sponds to the bore of the hollow shaft and is provided with semi-circular ear portions 14'' arranged at substantially 180° apart. The formation of this opening or nozzle causes the ejected fluid to be directed in a predetermined spray stream, that is, as the shaft is rotated the fluid will be ejected from the nozzle in a somewhat flattened formation which revolves and forms a circular formation which gradually increases in circumference as the stream advances. There will be comparatively no loss or dissipation of the fluid in its travel within practical limits as prescribed in this field.

A driven gear 16 is carried by the spindle to which it is suitably secured, and is positioned just beneath the bottom surface of the bearing 10. The gear 16 may be chamfered at its top to reduce friction between the contacting surfaces of the bearing 10 and gear 16. This driven gear 16 meshes with a driving gear 17 which is carried on the end of a crank shaft 18, and these elements may be suitably secured together, as for instance, by means of a pin 19. The crank shaft is journaled in the bearing 10 and suitable packing 20 is provided between the crank shaft 18 and bearing 10 to prevent exit or entrance of liquid with respect to the container. The crank shaft extends through the casing of the container and is provided with a tubular sleeve 21 in which one end of an operating crank 22 is rotatably positioned. As shown in Fig. 1, the crank 22 is of angular formation having a horizontal and a vertical portion, and said crank is adapted to be rotated 180° in a clock or counterclockwise direction from the closed position, shown in full lines, to the open and operated position, shown in dotted lines. The lower end of the crank is provided with a spring-actuated button 23 which serves, when depressed, to unlock the crank from either its closed position or its operating position so that it may be rotated to the opposite position. The release of the button locks the crank in the selected position. The crank 22 is provided with a shoulder which is of substantially the same diameter as the tubular sleeve 21 and this serves as a bearing therefor. The vertical portion of the crank terminates in an enlarged head or knob 24 in which a spring 25 and its support 26 lie interposed between shut-off washers 27 and 28. The head 24 provides a housing for these elements, and in the shut-off position of the crank, as indicated in full lines in Fig. 1, the spring exerts tension upon the lower washer 28 to maintain it seated upon the nozzle shield 13 and the ejecting end of the hollow spindle 14. By these means an effective seal is provided for the chambers A and L. A spring 23' at the lower end of the crank exerts tension and locks the crank in this relation. When it is desired to use this improved device for spraying to extinguish fires or for other purposes, the button 23 is depressed to release the tension exerted by spring 23' and to cause the release of the crank from its seated position on the nozzle just described. It is pointed out that the depression of the button 23 causes the crank to be raised slightly so that it clears the top of the nozzle shield 13. The spring has a compound action in that it provides a torsional strain on the crank and also provides tension to maintain the crank seated in either its closed or operated position. After the crank has been raised to clear the nozzle shield 13 it is then rotated 180° in a clock or counterclockwise direction to the position indicated by the dotted lines in Fig. 1. Upon the release of the button 23 the crank will be effectively locked in its rotated position by the tension exerted by the spring associated with said button similarly to the manner in which the crank is locked in its closed seated position upon the nozzle shield, as above outlined. The crank may be now rotated in a clockwise direction and cause a stream of liquid to be sprayed through the nozzle in a manner which will appear below.

An operating piston is carried on the hollow spindle 14 and is provided with an internal thread which corresponds to and fits the thread on said spindle. The piston is adapted to travel up and down the spindle when the operating crank lever 22 is rotated in the spraying operation. The piston divides the container into an upper and lower chamber A and L, respectively, the upper chamber containing air and lower chamber containing liquid. The piston is provided with a hub 29 which may be made from metal or from any suitable plastic material. The hub may be formed with an upwardly extending conical portion and a downwardly extending flange. This hub forms a support which carries the various elements constituting the piston. An annular nut 30 is threaded on the hub flange and maintains suitable pressure upon a plurality of associated disks or plates, and two of these disks are herein shown in Fig. 1 for the purpose of illustration. The upper disk 31 holds a piston gland and piston ring support in which the packings 32, 32', and the ring 33 are held in housed position. The lower disk 34 forms a plate whereby suitable pressure is applied to the disk 31 as well as the packings 32, 32' and the ring 33. The formation of the upper disk 31 or piston gland and piston ring support is more clearly shown in the modifications illustrated in Figs. 6, 7 and 11 while the formation of the lower disk 34 or pressure plate, is more clearly shown in Figs. 2, 3, 4, and 5 which illustrate certain modifications thereof. The upper disk 31 is shown in Figs. 6 and 7 as being substantially saucer-shaped and provided with a central opening through which the hub 29 of the spindle passes. A solid portion extends from this opening to segmental portions 35 which are cut in the disk and form resilient fingers or radially extending petal-shape portions terminating at the periphery of the disk. The disks shown in Figs. 1 and 11 are similar to those depicted in Figs. 6 and 7, as just described. In Figs. 1 and 11, however, there are provided in addition to the segmental portions 35, upwardly extending fingers between each segment 35. These upwardly extending fingers terminate in angular lugs 35', as more clearly indicated in Fig. 11. When a disk of this character is in position as shown in Fig. 1, the lugs 35' abut the lower surface of the hub cap and form an annular chamber about the hub 29 in which packing material 32' may be placed. An additional annular chamber is formed outside the chamber, just described, and lies between the lugs 35' and the wall of the container. Packing 32 may be placed in this chamber. The packing materials 32' and 32 may be made in a form and placed in the respective chambers, and the material may be of the same or different compositions. The material from which the packing ring 31 is made may be also the same as that of the packings 32' and 32 or the packings of ring 31 and 32 may form a unitary packing. In case an upper disk 31 of the character illustrated in Figs. 6 and 7 is used, only one packing chamber is provided. That is, the chamber which contain the packing materials 32 and 32' are combined. The lower disk 34 or pressure plate as shown in Figs. 4 and 5 is formed

similarly to the upper disk **31** shown in Figs. 6 and 7 with the exception that the ends of the fingers are partly looped as shown at **36**. In the modification shown in Figs. 2 and 3 the disk is similar to the disks previously referred to, having a saucer-like core portion. In this instance, however, the fingers or petal-shape portions are tangential as shown at **37**. By this arrangement the tangential fingers instead of making contact with corresponding fingers on the associated upper disk will make engagement with two adjoining fingers **35** of the associated upper disk, and greater pressure will be thus produced. The pressure produced by the upper disk will be increased by the additional pressure produced by the lower disk.

When pressure is exerted by the lower disk it will cause the associated upper disk to become somewhat distorted as may be seen in Figs. 1 and 8. The arrangement of the disks, as above described, will produce a maximum pressure upon the gland **32** and cause it to fit snugly against the inner wall of the container. The petals or fingers of the lower disk will afford additional outward pressure to the piston ring **33** and cause it to take up any irregularities of varying contour which may be present in the wall of the container **5**. A seal is thus provided between the chambers A and L which will effectively prevent the passage of air or liquid or other substance from one chamber to the other. A packing chamber preferably of conical formation is provided in the tubular extension of the piston hub, and a packing adjusting ring **38** engages the threaded wall of this chamber. The packing ring serves to close the chamber to drive the packing **38'** against the threaded shaft, and also to adjust said packing therein in accordance with wear. The formation of this chamber with its cone-shaped top prevents travel of the packing material with the thread of the spindle as this member is rotated.

The piston structure just described may have a duplicate structure added thereto, as indicated in Fig. 10, so that compression may be provided on either side of the piston hub. The piston under this condition would consist of the unit shown in Fig. 1, and a like unit inverted and placed on the top of the first mentioned unit to form therewith an integral structure. The conical portions of the hub **29** would of course be cut away under this condition, to reduce the size of the unit.

To discharge the liquid from the container the crank **24** is operated in the position indicated by dotted lines in Fig. 1. Rotary movement applied to the crank in this position will cause it to rotate the shaft **18**, which in turn will cause rotation of the gear **16**. This member, being fixed to the spindle, will cause the rotation of the latter, and the piston unit will be moved in a downward direction, causing the liquid to be expelled through the openings at the bottom of the spindle and ejected through the nozzle. By this means a steady spray of the container contents will be ejected and directed to the particular point desired. When rotary movement of the crank ceases, the ejection of the container contents will be shut off and the restoration of the crank to its seated position on the top of the nozzle, as indicated by full lines in Fig. 1, will again seal the container.

If desired an inverted conical coiled spring **40** may be employed and this may be seated in the depression **8** in the base and lies about the spindle **14**. When the piston travels downwardly and leaves the threaded surface of the spindle, the spring will exert such tension on the piston as to immediately raise it so that it reengages the threaded portion of the piston when the spindle is operated in the opposite direction. The wall of the cylinder may be slightly tapered at the bottom so that the diameter of the cylinder is slightly increased at this point. The friction between the cylinder wall and the periphery of the piston is thus somewhat decreased under the above condition, and the action of the spring is accelerated to lift the piston to its normal threaded engagement with the spindle.

From the foregoing it is thought that the construction, operation and many advantages of the hereindescribed and delineated invention will be apparent to those skilled in the art without further description. It will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit, or sacrificing any of the advantages of the invention as defined in the appended claims.

What is claimed is:

1. A spraying device including a cylinder having a shaft extending therethrough, a piston within said cylinder operated by the rotation of said shaft, a spray nozzle on the end of said shaft external to said cylinder, a driving shaft projecting from said cylinder and geared to drive said first mentioned shaft, and a crank associated with said driving shaft, said crank including a handle extending at right angles to the crank arm, said crank arm being pivotally connected to said driving shaft and having its axis of rotation at right angles to the axis of rotation of said driving shaft, whereby the handle of said crank may be swung into one position to seal said nozzle but when rotated into another position may be used as the handle of the crank to operate said driving shaft.

2. A spraying and ejecting device including a cylinder having a base at one end, a cap at the other end, a main shaft held in position by said cap, a piston on said shaft having a screw-threaded hub provided with a cap and a pair of abutting plates spaced therefrom, packing material in said space upon which said plates exert a pressure to force it against the cylinder wall to provide a liquid-proof and air-proof closure, a nozzle at one end of the shaft for directing the flow of fluid in a predetermined form of spray-stream, a crank arranged to rotate the main shaft, and including a crank arm always perpendicular to the crank shaft, and a member rotatable about the crank arm as an axis and arranged to serve in one position as a seal for the nozzle and in another as a handle for said crank.

3. A spraying device including a cylinder having a base at one end, a cap at the other end, a support in the cap, a hollow vertical threaded shaft the interior of which communicates with the interior of the cylinder and which shaft is held in position by said support, a piston on said shaft having a screw-threaded hub, a liquid-proof and air-proof cap including a plurality of contiguous and coacting resilient plates, a nozzle communicating with the hollow shaft for directing the flow of fluid, a crank arranged to rotate the vertical shaft, and including a crank arm always perpendicular to the crank shaft, and a member rotatable about the crank arm as an axis and arranged to serve in one position as a seal for the nozzle and in another as a handle for said crank.

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