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LATCH MECHANISM

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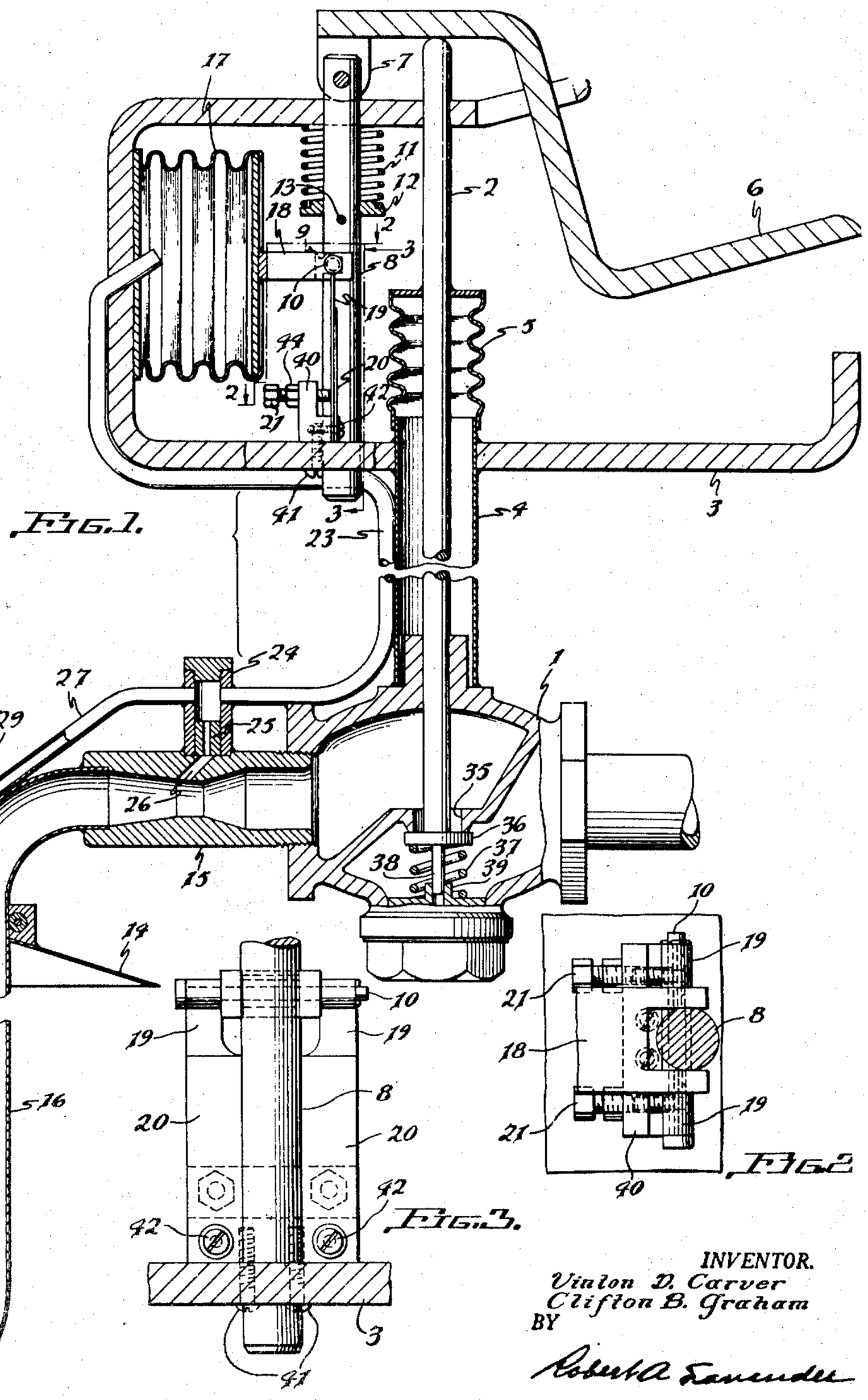

Fig. 1.

Fig. 2

Fig. 3.

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LATCH MECHANISM

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5 Claims. (Cl. 74—2)

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This invention relates to improvements in automatic latches or trigger mechanisms and is particularly concerned with a latch or trigger mechanism which is automatically operated and which can be made very sensitive to conditions to which it is responsive.

The primary object of the invention is to provide an automatic latch or trigger mechanism which is sensitive but which is very simple in design and construction and which has no unwieldy or cumbersome parts which are apt to bind or become inoperative as a result of wear or maltreatment.

An object of the invention is to provide an automatic latch or trigger mechanism comprising a spring latch member controlled by a detent, the detent being supported by a resilient tie member, and the tie member being arranged to oppose or restrain the latch spring while being readily movable at the point where it carries the detent so as to promote ease of actuation of the detent by automatic mechanism.

Another object of the invention is to provide an automatic latch or trigger mechanism comprising a spring latch member and restraining means therefore comprising a detent carried on the end of a resilient tie member arranged to restrain the mechanism in latched position.

Another object of the invention is to provide a latch or trigger mechanism comprising a latch member having a notch therein engageable by a detent carried on the end of a resilient bracket or tie member.

Various other objects of my invention and numerous of its advantages will become apparent from the following detailed description and annexed drawing wherein Figure 1 is a cross sectional view of a fluid dispensing nozzle having the device of my invention incorporated therein.

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a view taken along line 3—3 of Fig. 1.

The following detailed description describes an automatic liquid dispensing nozzle of the type which has an automatic shut-off mechanism for shutting off the flow through the nozzle when the container into which the liquid is being dispensed fills up, and the improved latch mechanism of our invention is described in association with the automatic shut-off mechanism of the nozzle. The device of our invention finds particular application in connection with a dispensing nozzle, as described, although it is understood that it may be utilized in many other ways and in many other devices. The dispensing nozzle is described

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in connection with the dispensing of liquid nitrogen into liquid nitrogen traps as an example of one use of the nozzle.

Referring to Fig. 1, numeral 1 designates the liquid nitrogen dispensing valve, the valve having a stem 2 extending upwardly into the housing 3 within which is the manual and automatic mechanism for operating the dispensing valve. The valve 1 is of conventional construction, the inlet being at the right and the outlet at the left and the port being designated 35. The valve member 36 seats upwardly and is urged in seating direction by a coil spring 37 which surrounds a guide stem 38 which extends downwardly from the valve member into a guide bearing 39 in the lower part of the valve casing. As shown, the housing 3 is separate from the valve body, being connected thereto by a tube 4 with the valve stem sealed by a corrugated expansible bellows 5. The stem 2 may be depressed to open the valve 1 by means of a handle 6 which has a lug 7 which forms a fulcrum at the top of frame 3 and to which is linked a latch member 8 which has a notch 9 in its center portion adapted to engage a roller on a rod 10 or pin forming a detent. Surrounding the member 8 is a coil spring 11 which bears against a disc 12 held in place by a cotter pin 13.

The operation of the parts as so far described is that when it is desired to open the valve 1, handle 6 is merely depressed and this causes the handle to turn about its pivot, that is, fulcrum 7, the stem 2 being thus depressed to move valve 1 in opening direction against biasing spring 37 which normally urges it in closing direction. When handle 6 is released spring 37 seals valve member 36.

The outlet of the valve 1 is connected to a Venturi tube 15 having a restricted throat, the venturi being connected to the dispensing nozzle 16 and the nozzle carrying a shield 14 for protection against splashing.

The mechanism for automatically closing the valve 1 when the trap is filled with liquid nitrogen includes a corrugated expansible bellows 17 within the housing 3, the movable end of the bellows 17 carrying a yoke member 18 which engages the pin or rod 10 so as to be operatable to pull it out of the notch 9 when the bellows collapse. The pin or rod 10 extends transversely through the arms of yoke 18 and the roller on pin 10 is between the yoke arms so as to reduce friction in movement into and out of notch 9. (See Figs. 2 and 3.)

The ends of rod 10 are engaged on the ends of

spring brackets 19 extending upwardly from the bottom of housing 3, the ends of the brackets being narrowed, as may be seen on Fig. 3, and they are curled over, that is, around the ends of rod 10 outside of the yoke 18. Pin 10 has a head at one end and a cotter pin at the other end to hold it in place. Adjacent each bracket 19 is a slightly shorter leaf spring 20 and the spring brackets and leaf springs are supported from a right angle bracket 40 attached to the bottom of casing 3 by screws 41, the spring brackets and leaf springs being attached to bracket 40 by screws 42. Numeral 21 designates adjusting screws extending transversely through bracket 40 with their ends bearing against spring brackets 19. The position of screws 21 may be set by lock nuts as shown at 44. The purpose of adjusting screws 21 is to adjust the force required to move the upper ends of spring brackets 19 and pin 10 to the left, that is out of notch 9. When screws 21 are screwed against members 19 and 20 the force tends to bend or spring these members to the right (Figs. 1 and 2). Thus a greater force is required to move the upper ends of members 19 to the left. Screws 21 are suitably adjusted and in this way the force required to pull pin 10 out of notch 9 is adjusted. Spring brackets 19 form resilient tie members which, through the detent formed by pin 10, restrain upward movement of member 8 when pin 10 is engaged in notch 9 in member 8.

The interior of the bellows 17 is connected by tube 23 to a plug member 24 having an internal recess which communicates through an orifice member 25 and a channel 26 with the restricted throat of the venturi. The recess within plug member 24 also communicates by means of a tube 27 with a vertical tube 28 extending downwardly within the vertical portion of the nozzle 16. At the upper end of tube 28 is a valve member 29 carried on the end of a rod 30 mounted longitudinally within the tube 28. The tube 28 and the rod 30 are made of materials having different coefficients of expansion so that the valve 29 is normally away from its seat to vent the tubes, but when the expanding nitrogen comes in contact with the tube 28 and rod 30, contraction of the different metals cause valve member 29 to seat, thus closing the vent. The purpose of the structure just described will become apparent below.

In operation, when it is desired to fill a liquid nitrogen trap with liquid nitrogen, the nozzle 16 is inserted into the trap and then the valve 1 is opened by depressing handle 6 in the manner described above. As the level of liquid nitrogen in the liquid trap rises, it immerses the lower end of the nozzle 16 covering a small orifice 31 which communicates with the interior of tube 28. When this happens, the valve 1 will automatically close in a manner to be described. When liquid nitrogen is flowing through the valve 1 and through venturi 15 a reduced pressure is produced in its restricted throat which tends to reduce the pressure in plug member 24 and also within the bellows 17 which communicates by way of tube 23.

When orifice 31 is above the level of liquid nitrogen, however, there is very little evacuation, that is, reduction of pressure, and bellows 17 does not function. However, when orifice 31 becomes covered, the pressure within the bellows 17 is reduced in the manner described and it tends to collapse, moving yoke member 18 and rod 10 to the left so that the rod is pulled out of notch 9 unlatching the latch mechanism, and when this happens, the valve 1 automatically closes. That is, the spring which is part of valve 1 moves the stem 2 upwardly, moving fulcrum 7 bodily upwardly and pulling member 8 upwardly against the force of spring 11. If the handle 6 is now released by the operator, the spring 11 will return the latch mechanism, and the fulcrum 7 back into the positions shown on Fig. 1 with the rod 10 relatching into the notch 9 as soon as bellows 17 expands.

The purpose of the valve member 29 and the vent in the tube 28 is to prevent the automatic mechanism operating to close the valve in response to the initial flow of vaporized liquid nitrogen which passes through the valve 1 when it is first opened. If the tube connections were not vented by valve member 29 when valve 1 is first opened, this initial flow of vaporized liquid nitrogen might produce such a vacuum in venturi 15 as to operate the bellows mechanism causing it to close the valve. By the time that the initial flow of vaporized liquid nitrogen has passed, valve member 29 will have seated sealing the vent and thus preparing the system to automatically operate when the trap becomes filled with liquid nitrogen.

From the foregoing those skilled in the art will observe that we have provided an efficient and sensitive latch mechanism characterized by simplicity of design and fabrication and possessing improved operating qualities.

The foregoing disclosure is representative of the preferred form of our invention and it is intended that it be interpreted in an illustrative rather than a limiting sense, and that the scope of the invention be determined only in accordance with the claims appended hereto.

We claim:

1. An automatic latch mechanism, comprising in combination, a latch member having latched and unlatched positions and having a portion adapted to be engaged by a detent, means urging said member toward unlatched position, restraining means comprising an element adapted to engage said portion and a bendable tensile member fixed at one end and attached at its free end to said element, said tensile member having a bending moment tending to hold said element in engagement with said portion, whereby said tensile member develops a tensile stress opposing said urging means and restraining said latch member in its latched position, and means operable to move said element against said bending moment out of engagement with said portion to release said urging means.

2. An automatic latch mechanism comprising in combination, a latch member having latched and unlatched positions and having a notch therein, means urging said member toward unlatched position, restraining means comprising a roller detent engageable in said notch, a bendable tensile member fixed at one end and attached at its free end to said detent, and means bearing against said tensile member intermediate its ends to apply a bending moment to said tensile member tending to hold said detent in engagement with said notch, whereby said tensile member develops a tensile stress opposing said urging means and restraining said latch member in its latched position, and means operable to move said detent against said bending moment out of engagement with said notch to release said urging means.

3. An automatic latch mechanism, comprising in combination, a latch member having latched

and unlatched positions and having a portion adapted to be engaged by a detent, means urging said member toward unlatched position, restraining means comprising an element adapted to engage said portion and a bendable tensile member fixed at one end and attached at its free end to said element, said tensile member having a bending moment tending to hold said element in engagement with said portion, whereby said tensile member develops a tensile stress opposing said urging means and restraining said latch member in its latched position, means operable to move said element against said bending moment out of engagement with said portion to release said urging means, and means for adjusting the bending moment of said tensile member.

4. Apparatus, as claimed in claim 1, wherein said tensile member is positioned to extend generally parallel to the direction along which said latch member is urged by said urging means.

5. An automatic latch mechanism, comprising in combination, a latch member having latched and unlatched positions and having a portion adapted to be engaged by a detent, means urging said member toward unlatched position, restraining means comprising an element adapted to engage said portion, a bendable tensile member fixed at one end and attached at its free end at spaced positions to said element, and manually

adjustable means bearing against said tensile member intermediate its ends to apply a bending moment to said tensile member tending to hold said element in engagement with said portion, whereby said tensile member develops a tensile stress opposing said urging means and restraining said latch member in its latched position, and means operable to move said element against said bending moment out of engagement with said portion to release said urging means.

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