Aug. 8, 1933. J. H. BENYA 1,921,113

DISPLAY DEVICE

Filed Nov. 22, 1930 2 Sheets-Sheet 1

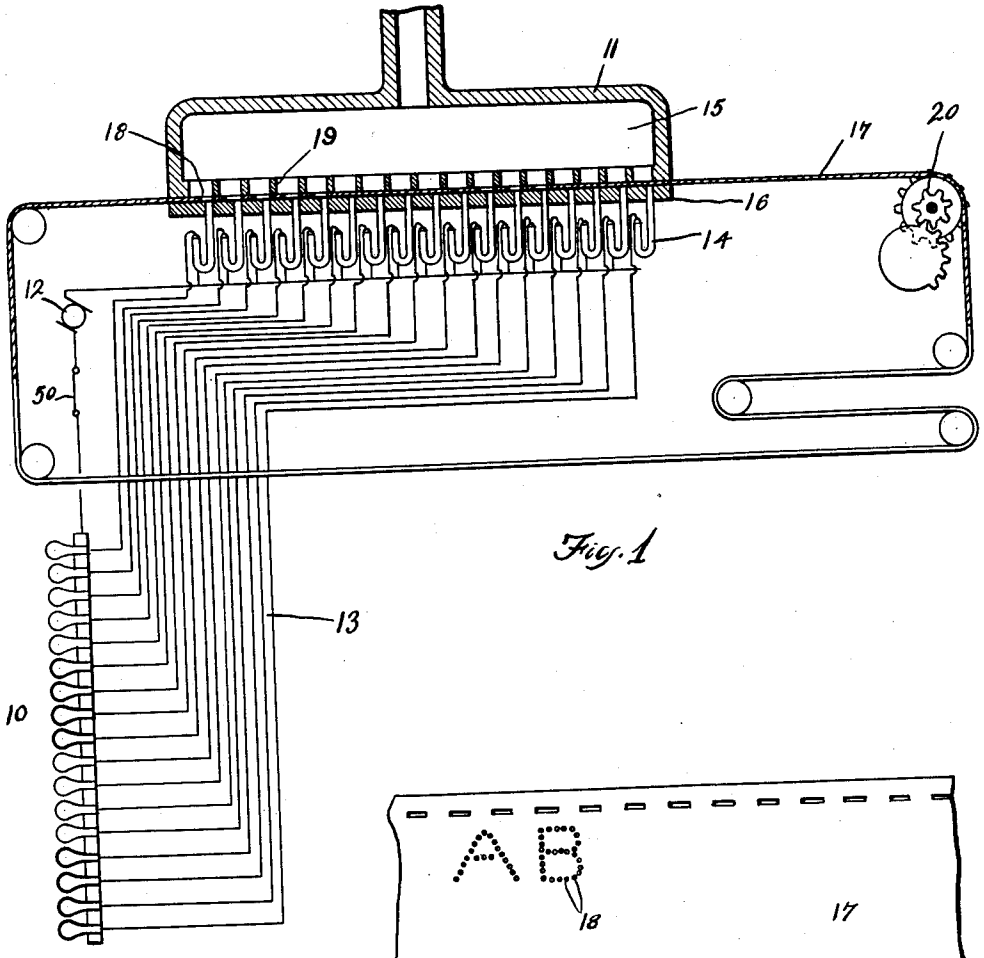


Fig. 1

Fig. 3

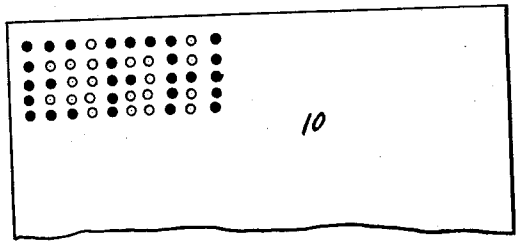


Fig. 2

INVENTOR.
John H. Benya
BY
Ray Oberlin & Ray
ATTORNEYS.

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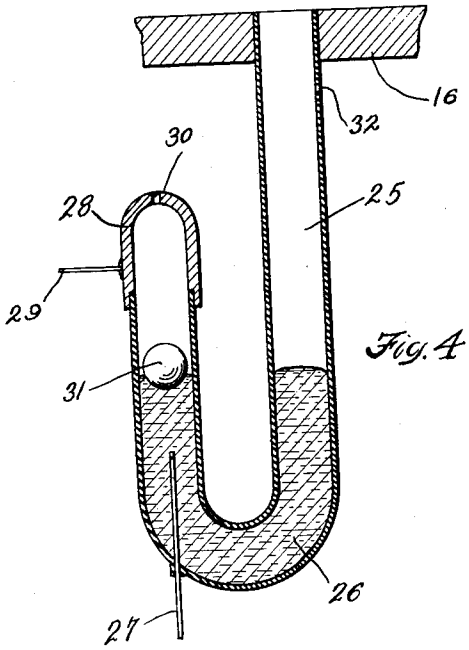


Fig. 4

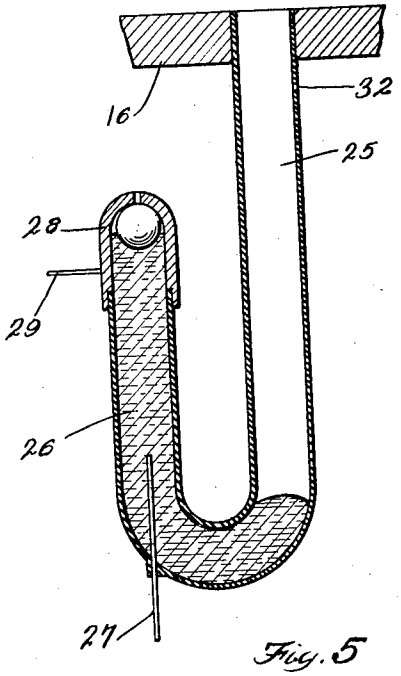


Fig. 5

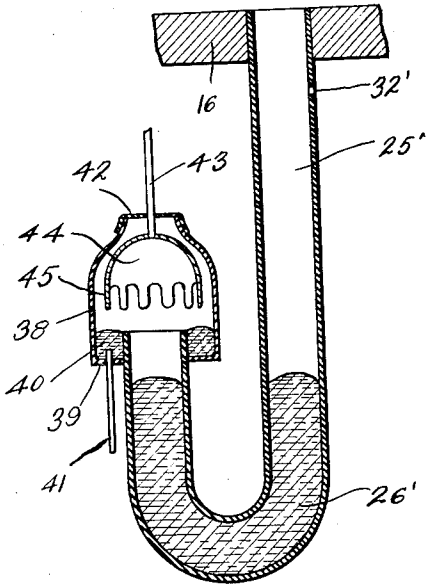


Fig. 6

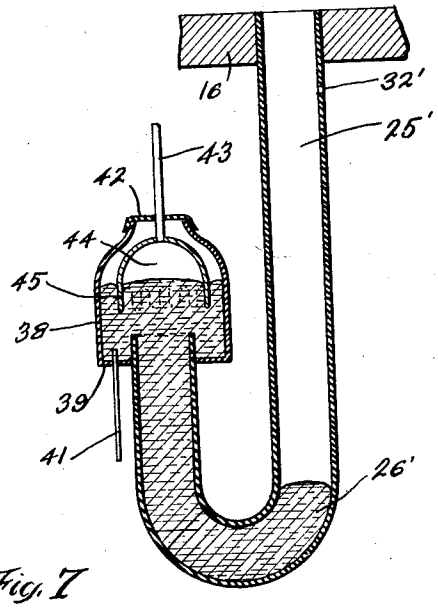


Fig. 7

INVENTOR.
John H. Benya
BY
Ray Oberlin & Ray
ATTORNEYS.

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UNITED STATES PATENT OFFICE

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DISPLAY DEVICE

John H. Benya, Lakewood, Ohio

Application November 22, 1930
Serial No. 497,426

13 Claims. (Cl. 200—46)

The present application relates to display devices and particularly to means for causing a succession of letters or other displays to appear on an electric sign. One of the features of the invention is a switch particularly adapted for this type of service. I have described below and illustrated in the accompanying drawings a preferred embodiment of the invention together with certain preferred modifications of the switch mechanism, but it is to be understood that the invention is not limited thereto but is susceptible of embodiment in various forms and by various means other than those herein shown.

In the drawings:—Fig. 1 is a diagrammatic view of my entire device; Fig. 2 is a fragmentary representation of a sign board with certain letters displayed thereon; Fig. 3 illustrates a section of tape by which letters may be displayed on the board; Figs. 4 and 5 illustrate a switch in "on" and "off" positions respectively; and Figs. 6 and 7 represent another type of switch in "on" and "off" position.

Referring now particularly to Fig. 1, a board, here shown as provided with a large number of incandescent lamps, is illustrated at 10 and a control mechanism for the board, generally indicated by the reference character 11. Power is furnished from a suitable source indicated at 12. Each lamp is connected as at 13 with an individual switch such as 14.

The control device comprises an air pressure chamber 15 in the bottom plate 16 of which a number of pneumatically operable switches such as 14 are inserted, leaving an air passage clear through the board. The top surface of the bottom board 16 is traversed by a tape 17 through perforations such as 18 in which air is allowed to pass from the pressure chamber 15 into whatever switches may have their upper ends in registry with such perforations. Cross bars 19 in the lower part of the pressure chamber hold the tape firmly against the bottom plate and the tape is traversed by suitable mechanism such as 20 which will ordinarily be of the step-by-step type.

A preferred form of switch is indicated in Figs. 4 and 5 and comprises a J-tube 25 in the bend of which a body of mercury 26 is held. The upper end of the long leg of the J-tube is fastened, as mentioned, in the bottom board 16, it being assumed that the tube will be made of a sufficiently strong non-conducting material to need no other support. An electrical connection 27 is brought into the tube near the bottom of the bend so as to be continually immersed in the mercury.

The other connection necessary to complete the circuit is made by a metal cap 28 having a conductor 29 secured thereto so that when the mercury rises to the position shown in Fig. 5 the circuit will be completed. When one of the perforations 18 in tape 17 registers with the top of the tube 25 the air pressure forces the mercury 26 into the position of Fig. 5. To prevent compression of air in the upper end of the short leg of the tube the cap 29 is vented as at 30. Escape of mercury through this vent is prevented by a ball 31 floating on the top of the column in the short leg. It will be observed that if the tape has been drawn away from the position in which the perforation registers with the top of the long leg, the top of this leg will be closed by a solid portion of the tape held down tightly by the cross bars 19. This situation would prevent drop of the mercury 26 to the "off" position of Fig. 4 except for the fact that a vent hole 32 is cut through the upper part of the long leg of the tube. This hole being of small diameter relative to the cross sectional area of the tube, the supply of air from the chamber 15 when the perforation 18 is in registry is much greater than the escape of air through the opening 32. Thus the switch cannot break contact so long as a tape perforation is opposite the upper end of the tube.

In Figs. 6 and 7 I have shown a modified form of switch wherein there is no insertion of a conductor such as 27 through the walls of the tube and wherein the cap 28 is replaced by a cap 38 of different construction. This cap 38 is of general cylindrical form, surrounding the lower end of the J and closed at the bottom by an annular portion 39 in such manner that a quantity of mercury 40 is always present in the lower part of the cap. A wire 41 furnishes the electrical connection to this small body of mercury. The cap 38 is somewhat closed in toward the top and covered by a porous member 42 through the center of which a wire 43 projects. The lower end of this wire carries a dome 44 with a plurality of fingers 45 around the bottom, the dome being made of conducting material and the wire 43 being part of the circuit. When the air is admitted to the long leg of the tube 26' the mercury rises in the short leg from the position of Fig. 6 to that of Fig. 7, surrounding the fingers 45 and making the circuit.

In the operation of the device it is contemplated that the tape 17 will be punched with letters or characters which it is desired to display on the board 10 and will be moved by successive steps so as to make a complete display which will be held on the board as long as desired, after which the mechanism 20 will advance the tape, ordinarily the entire length of the bottom board 16, when it will stop, showing a new display. While the mechanism 20 is shifting the tape, the entire board may be cut out by switch 50 connected by any suitable means (not shown) with the mechanism 20, or the streaking effect which will be caused by pulling the various perforations rapidly across all of the switches in a longitudi-

nal line may be intentionally retained to attract public attention to the board before the next display is formed.

The tape 17 may be either a closed bank, with a succession of displays which recur in fixed sequence, or it may be fed from a punching machine similar to a typewriter, as would be useful for the display of news items, stock quotations, etc.

Although I have above described a preferred embodiment of my invention, it is to be understood that I do not limit myself thereto but that other means and mechanism may be employed, based upon the same principles, the scope of the invention being indicated by the claims which follow:

I claim:

1. A switch comprising a J-tube, a fluid body of conducting material in the bend of said tube adapted to rise in the shorter leg thereof, means closing the upper end of said shorter leg to the passage of said conducting material while allowing free movement of air, spaced contact elements in said shorter leg constituting a gap in an electric circuit adapted to be connected by said material, and means for selectively applying pressure in the longer leg of said tube above said material.

2. A switch comprising a J-tube, a body of conducting material in the bend of said tube adapted to rise in the shorter leg thereof, means closing the upper end of said shorter leg to the passage of said conducting material while allowing free movement of air, spaced contact elements in said shorter leg constituting a gap in an electric circuit adapted to be connected by said material, means for selectively applying pressure in the longer leg of said tube above said material, and means in the upper leg of said tube for permitting escape of air at a slower rate than the supply.

3. In combination, a switch comprising a vertical J-tube of insulating material, an electric contact in the bend of said tube, a conducting cap on the top of the short leg of said tube, a column of conducting liquid in the bend of the tube, and means for forcing said liquid up said short leg into contact with said cap.

4. In combination, a switch comprising an insulated vertical J-tube, a cap on the top of the short leg, two spaced contacts in said cap, means on said cap for allowing escape of air while preventing escape of liquid, a body of conducting liquid in said tube adapted for movement to fill the space between said contacts, and means for applying pressure in the long leg of said tube above said liquid.

5. In combination, a switch comprising an insulated vertical J-tube, a cap on the top of the short leg, two spaced contacts in said cap, means on said cap for allowing escape of air while preventing escape of liquid, a body of conducting liquid in said tube adapted for movement to fill the space between said contacts, means for applying pressure in the long leg of said tube above said liquid, and means for slowly releasing said pressure.

6. In combination, a pressure chamber having a perforated bottom plate and means for selectively closing or opening the perforations therein, and a liquid switch connected by an air passage to each such perforation, said switches including means to prevent liquid from blowing out.

7. In combination, a pressure chamber having a perforated bottom plate and means for selectively closing or opening the perforations therein, and a liquid switch connected by an air passage to each such perforation, each said switch comprising a J-tube having conducting liquid in its bend and having its long leg constituting said air passage, one contact in the upper part of the short leg, and means on its short leg preventing escape of liquid.

8. In combination, a pressure chamber having a perforated bottom plate and means for selectively closing or opening the perforations therein, and a liquid switch connected by an air passage to each such perforation, each said switch comprising a J-tube having conducting liquid in its bend and having its long leg constituting said air passage, one contact in the upper part of the short leg, having a cap on the upper end of its short leg, said cap including an air passage, and closing means for said passage floating on the liquid in said short leg.

9. In combination, a pressure chamber having a perforated bottom plate and means for selectively closing or opening the perforations therein, and a liquid switch connected by an air passage to each such perforation, each said switch comprising a J-tube having conducting liquid in its bend and having its long leg constituting said air passage, an escape port in said passage of much less capacity than the passage, one contact in the upper part of the short leg, having a cap on the upper end of its short leg, said cap including an air passage, and closing means for said passage floating on the liquid in said short leg.

10. A switch comprising an insulated vertical J-tube, a cap on the top of the short leg, two spaced contacts in said cap, means on said cap for allowing escape of air while preventing escape of liquid, and a body of conducting liquid in said tube adapted for movement to fill the space between said contacts.

11. A switch comprising an insulated vertical J-tube, a cap on the top of the short leg, two spaced contacts in said cap, means on said cap for allowing escape of air while preventing escape of liquid, a body of conducting liquid in said tube adapted for movement to fill the space between said contacts, means for applying pressure in the long leg of said tube above said liquid, and means for slowly releasing said pressure.

12. A switch comprising a J-tube, a fluid body of conducting material in the bend of said tube adapted to rise in the shorter leg thereof, means closing the upper end of said shorter leg to the passage of said conducting material while allowing free movement of air, and spaced contact elements in said shorter leg adapted to be connected by said material.

13. A switch comprising a J-tube, a body of conducting material in the bend of said tube adapted to rise in the shorter leg thereof, means closing the upper end of said shorter leg to the passage of said conducting material while allowing free movement of air, spaced contact elements in said shorter leg adapted to be connected by said material, means for forcing said material down in the longer leg and up in the shorter leg, and means permitting the two ends of the material to resume the same level slowly.

JOHN H. BENYA.