

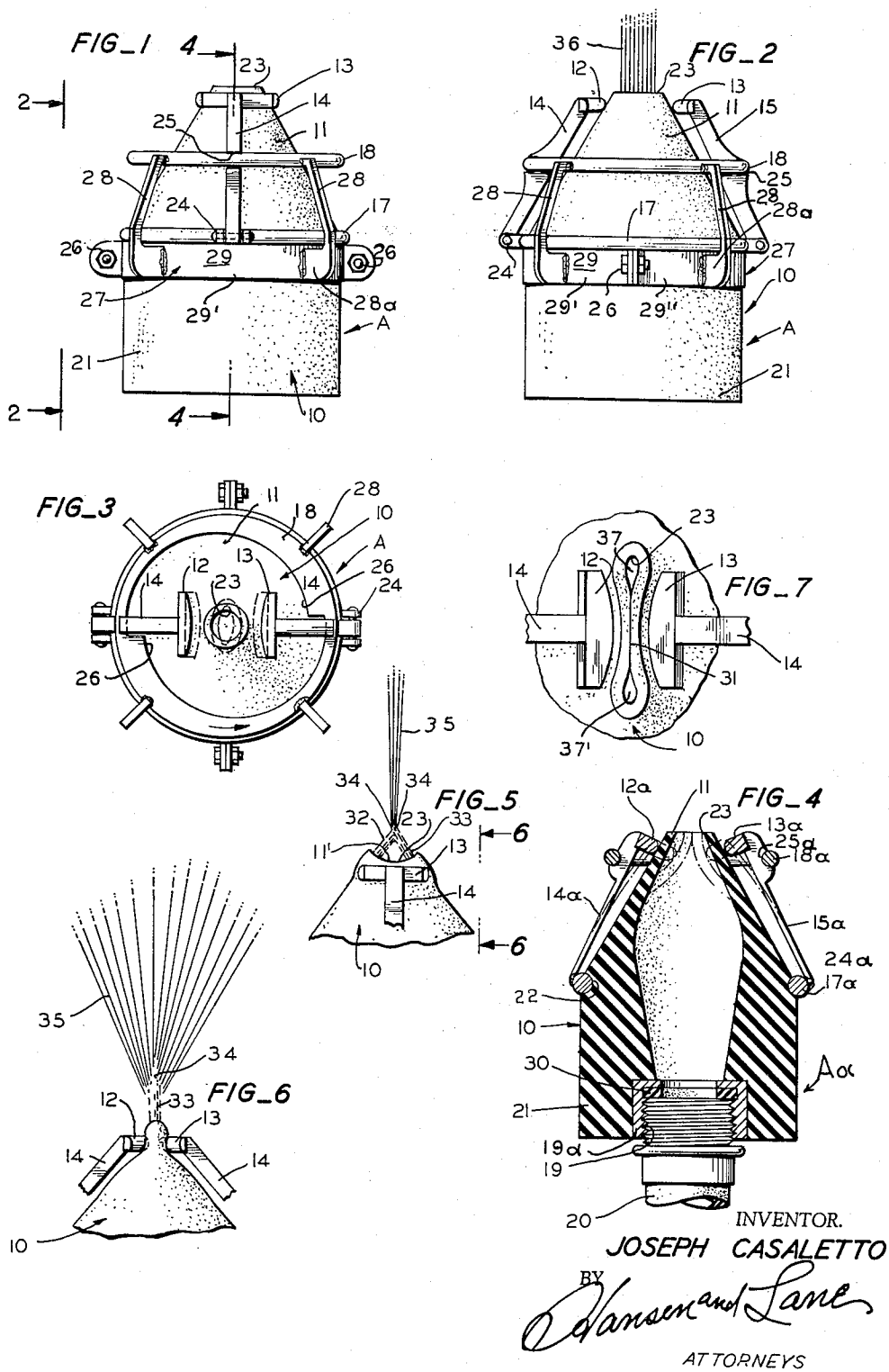
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ADJUSTABLE SPRAY NOZZLE WITH RESILIENT BODY

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## ADJUSTABLE SPRAY NOZZLE WITH RESILIENT BODY

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8 Claims. (Cl. 239-455)

The present invention relates to nozzles, and pertains more particularly to a nozzle having a resilient body portion which is easily adjustable from a condition where it discharges a substantially solid stream of generally circular cross sectional shape, through an oval coarse pattern and finally to a fine, flat, fan shaped spray.

In the past, various types of spray nozzles have been developed for producing liquid sprays of different shapes and characters. Many of these nozzles are adjustable to provide variations in the stream of liquid discharged therethrough, but most of such adjustable nozzles are either complicated and expensive, or are not capable of a full range of adjustment.

The present invention provides a spray nozzle having a truncated, conical body portion of resilient material having a pair of curved presser shoes mounted on opposite sides thereof adjacent its discharge end for deforming said discharge end, whereby, upon moving the shoes inwardly to compress the conical body portion, the spray pattern is first changed from a solid stream a coarse spray of substantially oval cross sectional shape, and finally into two convergent jets of liquid, so aimed as to impinge upon each other slightly beyond the nozzle and thereby to produce a fine, flat, fan shaped spray.

The invention also provides an improved nozzle having a deformable body of resilient material and of truncated conical shape, and a pair of curved, cam controlled presser shoes mounted on opposite sides of the nozzle body adjacent its discharge end so as to produce sprays of different shapes and character from pressurized liquid discharged through the nozzle.

A further object of the invention is to make an improved and simplified adjustable liquid spray nozzle.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawing, wherein:

Fig. 1 is a side elevational view of a nozzle embodying the present invention.

Fig. 2 is an elevational view looking in the direction of the arrows 2-2 of Fig. 1.

Fig. 3 is an end view of the discharge end of the nozzle shown in Figs. 1 and 2.

Fig. 4 is a sectional view taken as along line 4-4 of Fig. 1, but showing a modified presser shoe mounting arrangement a portion of a garden hose to which the nozzle is connected being shown.

Fig. 5 is an enlarged, fragmentary, side elevational view of the discharge end of the nozzle taken from the same direction as Fig. 1, and showing the nozzle compressed by the presser means to discharge a pair of converging liquid jets, which, upon impingement with each other, produce a fine, flat, fan shaped spray.

Fig. 6 is an elevational view looking in the direction of the arrows 6-6 of Fig. 5.

Fig. 7 is a further enlarged, fragmentary, end elevational view of the discharge end of the nozzle as it appears in Figs. 5 and 6.

Briefly, the illustrative nozzle A (Figs. 1-3) comprises

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a resilient body 10 having a conical wall 11 at its discharge end. This wall 11 is of a thinness to be easily deformable by a pair of curved presser shoes 12 and 13 mounted on support arms 14 and 15 on opposite sides of the body 10. The arms 14 and 15 are mounted on opposite sides of a circular support ring 17, which, in turn is rotatably mounted on the nozzle body 10. A cam ring 18 for controlling inward compressive movement of the presser shoes 12 and 13 is mounted for relative rotative movement to bear on the arms 14 and 15.

A threaded socket 19 is provided in the inlet end of the nozzle body 10 for connecting the nozzle to a suitable fluid conduit such as a conventional garden hose 20.

Referring to the drawing in detail, the illustrative nozzle body 10 may be molded of suitable resiliently deformable material, such as, for example vulcanized rubber, neoprene or a suitable resilient plastic material. Such materials are well known to those familiar with the art of rubber and plastic molding, and need not therefore be enumerated herein.

The illustrative nozzle body 10 comprises a cylindrical, tubular base portion 21 and truncated, conical discharge wall portion 11. The tubular base portion 21 preferably is relatively thick walled as compared to the conical wall 11, and the bore of this base portion 21 may be substantially the same as the bore of a liquid supply conduit, such as the hose 20, with which the nozzle is to be used. A threaded metal insert 19a is mounted in the socket 19, and is bonded in a well known manner to the nozzle body 10. The conical wall portion 11 preferably tapers slightly in thickness toward the discharge outlet 23 as illustrated in Fig. 4.

The presser shoe support ring 17 may be of suitable material, such as metal or a strong rigid plastic material, and is fitted for relative rotative movement in a groove 22 provided therefor in the nozzle body 10. The presser shoe support arms 14 and 15 as shown in Figs. 1-3 also are of suitable rigid material, such as metal or plastic, and, as shown in Figs. 1-3, are hingedly connected at 24 to the ring 17.

The presser shoes 12 and 13 may be integral with their respective support arms, and of similar material. The shoes are curved convexly on their inner sides so that when moved inwardly to the position shown in Figs. 5-7 the portions of the wall 11 between the central portions of the shoes 12 and 13 will meet, and the end face 11' of the conical portion 11 will be convexly curved as shown in Fig. 5.

The cam ring 18 is rotatably mounted in notches 25 of conforming shape provided therefor in the arms 14 and 15, and may be of suitable rigid material, such as metal or a hard, rigid plastic material. A pair of eccentric cams 26 (Fig. 3) are formed on the inner side of the cam ring 18 so that upon rotation of the cam ring in the direction of the curved arrow in Fig. 3 they will force the arms inwardly toward nozzle compressing positions shown in Figs. 5-7, and in broken lines in Figs. 3 and 4.

In order to maintain co-axial alignment of the cam ring 18 with the nozzle body 10, guide means 27 (Figs. 1-3) may be provided. The guide means 27 comprises four similar arms 28 fixedly secured to a split collar 29 which is journaled for rotative movement on the nozzle body 10. The collar 29 is composed of two similar semi-circular portions 29' and 29'' (Fig. 2) joined together by bolts 26. The arms 28 are offset outwardly at their bases 28a to clear the arm support ring 17 and the arms 14 and 15 during rotation of the cam ring 18 relative thereto.

In operating the nozzle A, the latter is screwed onto a suitable liquid supply conduit, such as a garden hose 20, a suitable gasket washer 30 preferably being provided

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in the socket 19 to insure a liquid tight seal between the hose 20 and the nozzle. When liquid is supplied to the conduit 20 at substantial pressure, such as a usual city water pressures of the order of 40 to 75 p.s.i., and with the cam ring 18 turned to its solid line position of Fig. 3 to free the arms 14 and 15 for separation to their positions shown in Figs. 1-3, the liquid 36 will be discharged from the nozzle in a full substantially solid stream of circular cross sectional shape.

As the cam ring 18 is gradually rotated in the direction of the arrow shown in Fig. 3, however, the presser arms 14 and 15, and the shoes 12 and 13 thereon, are gradually moved inwardly toward each other, thereby initially laterally compressing the discharge end of the nozzle wall 11 to generally oval shape as indicated in broken lines in Fig. 3. As the compression of the discharge end of the nozzle wall 11 progresses, the pattern of the liquid discharged by the nozzle changes to a coarse spray of a continually more elongated oval cross sectional shape. When the compression of the nozzle wall 11 by the presser shoes 12 and 13 progresses to the condition shown in Figs. 5-7, however, and the compressive action exerted by the curved presser shoes 12 and 13 causes the mid-portion 31 (Fig. 4) of the nozzle body beneath the presser shoes to meet, this closes off the flow of liquid through this central portion of the nozzle outlet 23, but leaves the two small openings 37 and 37' at the two sides thereof. The tapered form of the nozzle wall 11, plus the arcuate shape of the discharge end of the nozzle as indicated at 11' in Fig. 5, causes the liquid to be discharged through these small openings 37 and 37' in two jet-like streams 32 and 33 (Figs. 5 and 6) which are directed convergently toward each other and impinge against each other at a point 34 a short distance beyond the nozzle outlet 23. When this occurs, the previously coarse spray pattern is transformed thereby into a fine, mist-like spray, which fans out in a plane at right angles to the contacting central portions 31 (Fig. 7) of the nozzle body. The fineness of the spray 35 produced by the impinging jets 32 and 33 may be controlled by the compressive force exerted on the presser shoes 12 and 13, the greater the compressive force, and therefore the smaller the jet streams 32 and 33, the finer will be the resultant spray.

In the modified and presently preferred presser arm construction of Fig. 4, the presser shoe support arms 14a and 15a are of suitable springy material, such as spring metal or plastic, and are fixedly secured at 24a to the support ring 17a. Since the parts shown in Fig. 4 are generally similar, in structure and operation, to the corresponding parts shown in Figs. 1-3, the former are designated by the same reference numerals as their counterparts of Figs. 1-3 plus the suffix "a."

When released by the cam ring 18a of Fig. 4 the arms 14a and 15a are biased by their spring construction outwardly toward their separated, or nozzle releasing condition similar to that of the arms 14 and 15 in Figs. 2 and 4. The operation of the nozzle Aa shown in Fig. 4 is similar to that of the nozzle A of Figs. 1-3 and described previously herein.

During use, the entire cam ring and presser shoe assembly can be rotated bodily as a unit around the nozzle body 10, in any degree of compression of the latter by the presser shoes 12 and 13. When using an oval or fan shaped spray, as explained previously herein, this spray pattern may be turned rotatively about the axis of the nozzle by thus turning the entire presser shoe and cam ring assembly.

The invention provides a simple, inexpensive and effective adjustable liquid spray nozzle which has no internal mechanism to restrict the flow of liquid therethrough, and from which liquid spray may be discharged in a wide variety of patterns, from a full stream through a coarse spray of oval cross sectional shape, and finally to a fine, fan shaped spray.

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While I have illustrated and described a preferred embodiment of the present invention, and one modified form thereof, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

10 I claim:

1. An adjustable liquid spray nozzle comprising a body portion having a passage therethrough, one end of said body portion being the inlet and the other the discharge end thereof, means at the inlet end of the nozzle for connecting the latter to a duct adapted to conduct liquid into the nozzle at pressures substantially above atmospheric pressure, a deformable wall of truncated conical shape and of resilient material comprising the discharge end portion of said nozzle and having a discharge opening in the truncated end thereof, presser means on opposite sides of the conical wall adjacent the discharge opening, said presser means being so shaped that when moved inwardly toward the truncated wall from a position laterally clear thereof, said presser means initially deform the truncated end of the conical wall to substantially oval cross sectional shape, and, when moved further inwardly, force a meeting of the opposite portions of the conical wall between said shoes, and leave a pair of small openings, one on each side of said meeting portions of said wall, the angle of convergence of the conical nozzle wall being such that, in the latter condition of the nozzle, two jet streams are discharged convergently one from each of the small openings remaining one on each side of the meeting portions of the conical wall, which, upon impingement with each other, create a fine, fan shaped spray pattern.

2. An adjustable liquid spray nozzle comprising a body portion having a passage therethrough, one end of said body portion being the inlet and the other the discharge end thereof, means at the inlet end of the nozzle for connecting the latter to a duct adapted to conduct liquid into the nozzle at pressures substantially above atmospheric pressure, a deformable, axially outwardly tapered wall of resilient material comprising the discharge end portion of said nozzle and having a discharge opening in the terminal end thereof, presser means on opposite sides of the tapered wall adjacent the discharge opening, cam means acting on said presser means for moving the latter inwardly to adjusted position for compressing the terminal portion of the tapered wall, said presser means being so shaped that when moved inwardly from a position laterally clear of the tapered nozzle wall, said presser means initially deform the terminal end of the tapered wall to substantially oval cross sectional shape, and when moved further inwardly, force a meeting of the opposite portions of the terminal portion of said tapered wall, and leave a pair of small openings, one on each side of said meeting portions, the angle of convergence of the conical nozzle wall being such that, in the latter condition of the nozzle, two jet streams are discharged convergently one from each of the small openings remaining one on each side of the meeting portions of the tapered wall, which, upon impingement with each other, create a fine, fan shaped spray pattern.

3. An arrangement according to claim 2 wherein the presser means is a pair of presser shoes curved convexly on their inner sides.

4. A liquid spray nozzle, comprising a body portion, a deformable discharge end portion on said body, said discharge end portion being of resilient material and of truncated conical shape, a pair of presser shoes mounted one on each of two opposite sides of the discharge portion adjacent its discharge end, said shoes being convexly curved on their inner sides, said shoes being located near the discharge end of said conical portion, and movable

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from a position laterally clear thereof to a position forcing the opposite sides of the body portion between the shoes into meeting relation, the curvature of the shoes being sufficiently acute to leave a small opening on each side of the meeting portions of the body portion between the shoes in the latter condition of the body end portion, the angle of convergence of said conical portion wall being such that, in the latter condition of the nozzle, two jet streams are discharged convergently one from each of the small openings remaining one on each side of the meeting portions of the nozzle, which, upon impingement with each other, create a fine, fan shaped spray pattern.

5. An arrangement according to claim 4 wherein the shoes are supported upon an annular member mounted rotatably on the body portion, and the shoes and mounting ring are rotatable as a unit co-axially around the nozzle to change the position of the spray pattern discharged by the nozzle with the shoes moved inwardly to compress the body portion.

6. A liquid spray nozzle, comprising a body portion, a deformable discharge end portion on said body, said discharge end portion being of resilient material and of truncated conical shape, a pair of presser shoe support arms mounted for swinging movement toward and away from the body portion, one on each of two opposite sides of the body portion, a presser shoe mounted on the free end of each support arm and positioned to have pressing engagement with said discharge end portion adjacent its discharge end, said shoes being convexly curved on their inner sides, said shoes being movable upon a swinging movement of said arms from a position laterally clear of the nozzle to a position compressing opposite sides of the nozzle between the shoes into meeting relation, the curvature of the shoes being sufficiently acute to leave a small opening on each side of the meeting portions of the nozzle between the shoes in the latter condition of the nozzle the angle of convergence of the conical end portion being such that, in the latter condition of the nozzle, two jet streams are discharged convergently, one from each of the small openings, which streams, upon impingement with each other, create a fine, fan shaped spray pattern.

7. A spray nozzle, comprising a body portion, a deformable discharge end portion on said body, said discharge end portion being of resilient material and of truncated conical shape, a pair of presser shoe support arms mounted for swinging movement one on each of two opposite sides of the body portion, a presser shoe mounted on the free end of each support arm and positioned to have pressing engagement with said discharge

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end portion adjacent its discharge end, said shoes being convexly curved on their inner sides, said shoes being movable upon a swinging movement of said arms from a position laterally clear of the nozzle to a position compressing opposite sides of the nozzle between the shoes into meeting relation, the curvature of the shoes being sufficiently acute to leave a small opening on each side of the meeting portions of the nozzle between the shoes in the latter condition of the nozzle so that as the arms are swung inwardly to force the shoes to compress said discharge end portion, sprays of different cross sectional shape and character will be produced from a stream of pressurized liquid discharged through the nozzle, a cam ring surrounding said support arms and rotatable relatively thereto for controlling inward and outward movement of the presser shoes, and guide means supported on the body in guiding connection with the cam ring for holding the latter co-axial with the body during rotative movement of the cam ring.

8. A spray nozzle having a truncated conical body portion of deformable, resilient material and with a discharge opening at the truncated end thereof, a pair of presser shoes mounted one on each of two opposite sides of the conical body portion adjacent the discharge opening therein, said shoes being convexly curved on their inner faces and movable convergently inwardly from a position laterally clear of the nozzle to a position compressing opposite sides of the body portion adjacent the discharge opening, the area of pressure of the shoes on the body portion transversely of the latter being limited by their curvature to a width of less than the diameter of the discharge opening, whereby, upon moving the shoes inwardly from a position laterally clear of the nozzle to compress the body portion, a stream of pressurized liquid flowing through the nozzle and out the discharge opening is changed from a substantially solid stream, first to a coarse spray of substantially oval cross sectional shape, and finally, upon a meeting of the two sides of the nozzle portions beneath the presser shoes, to two convergent jets of liquid so aimed as to impinge upon each other slightly beyond the nozzle and thereby produce a fine, flat, fan shaped spray.

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