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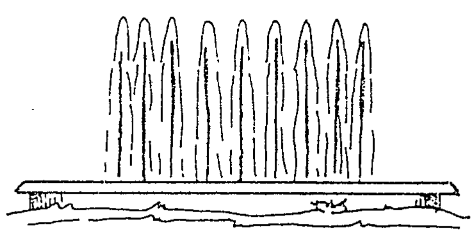
(54) **Cybernetic ornemental fontain and color organ.**

(57) Cybernetic ornamental fountain which includes various water output nozzles, a system to control its flow and complementary decorative and spectacular elements, there being associated with each nozzle a valve formed by a cylindrical plug sliding in a valve passage orifice and an electromagnetic control system that comprises a ferromagnetic core and an annular electromagnetic coil. Also, there are provided at least one rhythm conveyor, formed by a group of selected nozzles, and at least one unit of projectors that each carry four red, green, blue and white colored lamps. The invention is applicable to fountains installed in plazas, parks, expositions and other locations with decorative and spectacular purposes.



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Description

CYBERNETIC ORNAMENTAL FOUNTAIN AND COLOR ORGAN

Technical Field

The object of this invention is a cybernetic ornamental fountain, provided with a suitable number of nozzles, which is completed by a series of decorative and spectacular elements, of any imaginable type, such as laser beam projectors and the like, coordinated among themselves so that different sensations are achieved such as surprise, fright, joy, sadness, euphoria, humor, meditation, perplexity, poetry, romanticism and generally all the effects related to the complex world emanating from the soul and human feelings.

This object is to be achieved by taking advantage of the immense possibilities offered by present technology of cybernetic science and those related to it such as robotics, data processing, remote control, and the like.

Background

For a better understanding of the scope and repercussions of this invention, a historical reference is made below to the technological milestones that have marked the development of ornamental fountains. Each of the successive stylistic steps has been, logically, the consequence of the historical, technical and artistic context of its period, but the particular fact that jets and illumination elements depend on a suitable, constant source of energy, has characterized the stylistic advance of ornamental fountains as very sensitive to the technical factors at each moment. Therefore, until the appearance of electric energy at the end of the last century, ornamental fountains could be defined as purely sculptural, without their own illumination, of stationary aquatic architecture. Most of the time, water represents a mere accompaniment to the main motif of the fountain or sculptural group, since the flows, depending exclusively on pressures caused by natural level differences, are limited or intermittent. Consequently, the style of fountains up to that time, was bound to the architecture or gardening, with a predominance of classic and baroque forms in geometric repetitions and symmetries.

The appearance of the pumping engine and submersible electric projector provides ornamental fountains with autonomy. Now water by itself can constitute the main motif of the fountain, observable both day and night. However, the possibilities of expression continue to be limited. Aquatic architecture is stationary, since it is not technologically possible to adequately vary the flows of the fountain. Therefore, the creative effort of artists is directed to searching for new scenarios formed by waters. The style remains based on classic geometry of symmetric composition, since all the aquatic elements are presented simultaneously.

Further technological developments make possible the incorporation of systems of sequential variation of the flows to achieve in the present invention what can be called an electromechanical fountain. Various apparatus such as variable speed motors, motor-operated valves, mechanical programmers to obtain sequential blocking of the hydraulic circuits, and the like, can be installed in the fountain to achieve the desired effects. Instead of a detailed exposition of these apparatus, it is of interest here to emphasize a series of common characteristics which are those that determine the present style of ornamental fountains.

First, it is now possible to make various groups of aquatic elements appear or disappear: the fountain thus has various circuits that "play" with one another, forming various combinations that are presented sequentially in time. The fountain can incorporate a program and even arrive at the rhythm of a musical piece, as is the case with recent embodiments. However, there are still great limitations: the devices for varying the flow are in the fountain machine room, and for reasons of cost cannot be extended to each of the water jets. Instead, they block the few circuits that group various jets, and which therefore channel considerable water flows. As a consequence, when the jets appear or disappear in groups, it is not possible to dispense a symmetry of composition, therefore the style of the fountain maintains its classic character. On the other hand, the flows to be put into play require long stopping times, to avoid problems by water hammer or vibration, which in turn causes delayed responses in proportion to the inertias of these circuits. This characteristic, together with the use of a relatively small number of independent circuits, causes little flexibility to exist in the programming of such displays. Furthermore, the response times are generally not compatible with other elements of a noninertial character (illumination, music, laser, etc.), which ordinarily are incorporated in modern fountains.

To sum up, the present fountain continues to be planned as a group of independent circuits, each of them made up of various jets. For this reason, they can adopt a geometric composition of classic style. In the case of incorporating water plays, the times of response to the changes are high, while the combination possibilities are limited, since the number of independent circuits that come into play rarely exceeds ten. This contrasts with the expressive possibilities offered by light either used in the conventional form of underwater colored projectors or through the new spectacular techniques offered by the laser. Since light is a noninertial element of simple operation, an integral control of a multitude of points or directions by a microprocessor can readily be achieved. This causes the classic composition to be abandoned, with the creation of forms, drawings and designs more in keeping with present art trends being attainable.

Working in this field, the applicant has achieved one development, as described in Spanish Patent Application No. 8700079, filed January 15, 1987, with the basic object of linking ornamental fountains with the currents of modern art. By providing such fountains with the possibility of a totally "flexible" programming, both in regard to aquatic architecture itself and its scenographic capability of representing the most varied musical pieces, the total system can be controlled by a computer. Thus, it is now possible to speak correctly of a cybernetic fountain as a successor of the electromechanical fountain. In this development, the need has arisen of having, in such fountains, totally independent jets of individualized and simple control in sufficient amount for the requirements of the new criteria of composition and design of forms and new, original variations. This requires the development of a valve preferably operated by electric means, so as to be perfectly suited to the specifications and operating environment of an ornamental fountain. Such a value differs substantially from the presently used electrohydraulic valves of conventional fountains which totally block the flow to provide the variation of height of the jets in amplitude and time sufficient to achieve the desired effects.

An example of the water displays of a prior art fountain, appears in Figures 1a and 1b. These figures describe an electromechanical fountain of medium size and circular shape, with plays of water and light, which, in its most representative combinations or plays, typically responds to the aquatic architecture. In this example, the fountain has four independent circuits that can appear and disappear individually in the course of the program or sequence of plays of the fountain. In Figure 1a, these circuits are represented in four separate views: a central vertical jet (1); surrounded by a palm tree of eight parabolic jets (2); while on the outside, a crown of twenty four vertical jets (3) are located in the average diameter of the fountain.

Finally, there is a cupola formed by twenty four parabolic jets (4) that shoot from the perimeter toward the inside of the fountain. Altogether, there are fifty seven jets grouped in four circuits; i.e., the jets corresponding to each circuit appearing simultaneously. This is the reason why each circuit has to be structured in a symmetrical architecture around the main axis of the fountain; obviously, departure from this symmetry would be to the detriment of the aesthetics and composition of the fountain.

In Figure 1a, the circuits have been represented separately; some possible combinations that can be obtained by grouping circuits are outlined in Figure 1b, but it will be seen immediately that the number of these is very limited. Specifically, with four circuits, no more than fifteen different displays can be established, this number being equivalent to the combinations that can be achieved with four elements taken in groups of one, two, three or four elements. With this brief description, the aesthetic limitations of such a fountain are made clear. The architecture is very restricted to some neoclassic rules of symmetry, and very few possible combinations. Also the inertia factor which prevents obtaining a rapid rhythm in the sequence of the plays and synchronization with the noninertial elements, is seen to be an inherent disadvantage.

In contrast with this prior art, one can imagine what a cybernetic fountain would be with these fifty seven individualized jets, controlled at a rapid rhythm by a computer or programmable robot, to create multiple figures, variations, pursuits, etc., or to interprete a musical piece like a true aquatic ballet; all this achieved at an equivalent economical investment level. In such a case, the number of possible combinations for fifty seven elements exceeds a hundred trillion. Thus, for these numbers it is possible to speak not only of a quantitative but also a qualitative advance in the art.

It is not possible to represent in figures all the unlimited possibilities that are opened up by this new technique, since a system of innumerable degrees of freedom is involved. By analogy, a cybernetic fountain can be compared to a computer display screen, in which each element or pixel has an individualized, simultaneous control of its intensity and color parameters, with noninertial variation. The expressive possibilities of such screens do not depend either on the screen itself or the power of the computer to which they are connected, as is the case of their application to animated drawings. Analogously, a cybernetic fountain can be structured by having a sufficiently extensive network of nozzles and color projectors. The selective operation of various groups of elements according to a program can give rise to an infinity of figures and fantasies, even with synchronized movement in the pool of the fountain. Objects such as fish, boats, flowers, trees, abstract bodies, ballerinas, and the like can appear, move and dance with the only limitations being the imagination of the designer and the programmer of the fountain.

Spanish Patent Application No. 8700079 represents an effort to achieve the multiple effects outlined above, With Figure 2 illustrating in this sense an approximation of the expressive characteristics of such a cybernetic fountain. This figure represents a small group of vertical jets, which governed by this principle, and used to create mobile figures that are transmitted along the fountain in the same way that a disturbance is moved in an undulating movement without a transmission of material. Figure 2a represents advancing sails, while 2b represents recurring waves. While in the traditional fountain (Figure 1), the only possible movement is in unidimensional height, i.e., the jet only rises or drops, another dimension is gained in the cybernetic fountain, either in the direction crosswise to the observer or in depth. To this new spatial dimension is to be added the dimension gained in figurative expression, as well as the capability of synchronizing each water point with a light projector. Also, by associating color with water, equal expressive richness can be achieved.

Actually, the freedom of expression should be total; it would not be necessary to be subject to a composition of classical symmetry. Since each jet is independent of the rest, the water would take on a protagonist role and could carry on a dialogue with the light in time with the music. Even without music, the most varied designs and movements could be created. The fountain could then be considered as a medium of expression of sufficient category in the service of present art. In a word, the present fountain is designed to obtain an individualization of its elemental jets, with the possibility of its direct operation by a microprocessor. Since this response belongs to a noninertial element, it is possible not only to totally integrate water, light and music but also to achieve a flexibility and total freedom in the design, so that the fountain can satisfy, with shapes and original movements, the creative requirements of modern art.

SUMMARY OF THE INVENTION

The applicant proposed to improve the operational and ornamental characteristics of cybernetic fountains of the prior art, and in particular of the fountain in his prior Spanish Patent Application No. 8700079. In the course of his studies, the inventor has discovered new means for regulating the nozzles, which are much simpler and faster in operation. This improved means includes a sliding cylindrical plug, which blocks an orifice through which the water flow is to pass when said means reach the open position. The movement of this plug is achieved by an electromagnetic control system consisting of a core axially movable in a central orifice of a stationary electromagnetic coil concentric with the geometric axis of said core, and a recoil spring, which is intended to return the plug automatically to the closed position after being placed between the core and the plug. In this plug are provided some axial orifices, whose task is to equalize the pressures on both sides of the plug, in order to eliminate static reactions in the movement of the plug. The sealing jacket of the adjustment means does not have a fine mechanical fit with the plug so that sufficient play of the plug, is assured and the risks of jamming by friction are avoided.

Also, the applicant has thoroughly studied the coordination of light and sound in these cybernetic fountains and has noted that, so far, the usual art solves the regulation and synchronization of light in relation to music by the process of achieving a selective filtering of the musical signals. This is an indication that a predominance of low, middle and high frequencies are being obtained, with the separation between these intervals being arbitrary and subjective in most cases. The most frequent situation is to assign to the interval or range of low notes the frequencies between 27 and 150 Hz (note La (-4) and note Re (-1)), to the middle notes the interval between 150 and 700 Hz (note Mi (-1) and note (Fa +1)), and to the high notes the interval between 700 and 4200 Hz (note So (+1)) and note Do (+4)). Finally, a direct association is made between these three intervals and the color present in the fountain, so that red corresponds to the low signals, green to the middle ones and blue to the high ones. The numbers in parentheses which specify the above-mentioned notes indicate the octave to which they correspond, taking as a reference the 0 (zero) or central octave, which extends from Do (0) = 262 Hz to Ti (0) = 494 Hz.

In trying to achieve a much more precise music-color correspondence, in which is also present the cyclic aspect of the repetition of notes in the successive octaves, the applicant discovered a way of associating color with music based on the close nature of the two phenomena, considered both in their physical aspect and in that of provoking psychic sensations. The objective is to produce at least seven differentiated colors to which the seven notes of the diatonic scale (Do-Re-Mi-Fa-So-La-Ti) are made to correspond. These colors are obtained in distinct degrees of saturation, from the purest range (saturated colors) to the lighter range (colors with a strong addition of white), so that the series of musical octaves from the lowest to the highest can be associated with a series of color ranges from the most saturated to the lightest. Analogously, if twelve differentiated colors are produced, also in distinct degree of saturation, the association can be made with the chromatic musical scale of twelve notes, i.e., Do-Re-Mi-Fa-So-La-Ti and the sharps # Do-Re-Fa-So-La.

The definition of color given by the Optical Society of America is the following: "The color is made up of these characteristics distinct from that of space and time, light being the aspect of radiant energy which man perceives through the sensations that are produced by the stimulation of the retina."

The characteristics of the light included in this definition are:

1. Luminous flux which is a measure of the effectiveness of light to cause the sensation of brightness;
2. Predominant wavelength which defines each color: red, green, blue, etc.
3. Saturation, which is the percentage of presence of the predominant wavelength of the entire luminous spectrum.

All these concepts can be reduced to mathematical laws which we will see below, so that its integration by the microprocessor means of the cybernetic fountain is entirely feasible. In our analysis, we will refer only to the color obtained by projectors and to their additive mixtures.

We will start from the use of three projectors R, G and B, which project three primary colors: red, green and blue, respectively, to provide additive mixtures.

The red-green mixture provides the yellow hue, green-blue the cyan hue and the blue-red the magenta; the sum of the three provides white.

If in the R,G,B projectors the luminous flux is controlled by a physical device, we observe that it is possible to obtain a broad range of X colors by additive mixtures of the components R, G, B in suitable proportions. Therefore, we can measure and quantify the hue of each color obtained as a function of R, G and B.

Chromatic diagram: Let us represent by R, G and B the amounts of the three components necessary to obtain a color of the spectrum. For convenience, the three new magnitudes X, Y and Z are defined by the equations:

$$X= \frac{R}{R+G+B} \quad ; \quad X= \frac{G}{R+G+B} \quad ; \quad Z= \frac{B}{R+G+B}$$

Obviously, X + Y + Z = 1, so that any two of these magnitudes are sufficient to define a color. This makes it possible to represent the colors in a diagram of two dimensions, taking, for example, X and Y as coordinates, when the above process is applied to the colors of the spectrum, the tongue-shaped curve of the prior figure is obtained, and is called the spectrum locus curve. The numbers on the curve are the wavelengths in millimicrons. The ends of the curve which correspond to 400 microns and 700 microns, are joined by a straight segment. That figure is called a chromatic diagram.

The numbers of colors commonly associated with certain wavelengths of the spectrum are indicated below.

The amounts of the components R, G, B necessary to obtain an arbitrary color (i.e., a mixture of light formed by many different wavelengths) can be obtained by an integration process. The values of X and Y for the arbitrary color are calculated from the above formulas and the point that represents this color can then be drawn on the chromatic diagram. It turns out that if the color is saturated, belonging to the natural spectrum or rainbow, its image is found on the contour curve, while if it is light (or not saturated), its image is toward the inside or point C, this latter being the representation of white.

In contrast with the prior art, which is based on the installation in ornamental fountains, of submersible projectors with three colored lamps, (i.e., a red, a green and a blue), in which are produced by selective operation of said lamps the unitary colors red, green and blue, the binary colors yellow (red plus green), cyan (green plus blue) and purple (red plus blue) and, finally the ternary mixture which equals white, the applicant has created a submersible projector that has four lamps, a red, a green, a blue and a white, which, by the fountain microprocessor means, are operated selectively and individually, with adjustment of its luminous power at variant levels. In this way, a projector according to the invention can provide an unlimited range of hues, as a function of the power levels for each lamp and of all the color mixtures that can be made.

By way of nonlimiting example, corresponding to the musical diatonic scale a projector according to the invention would establish the following levels for its lamps: red lamp, 2 levels (turned off and turned on 100%); green lamp, 2 levels (turned off and turned on 100%); blue lamp, 3 levels (turned off, turned on 50% and turned on 100%); white lamp, 4 levels (turned off, turned on 40%, turned on 70% and turned on 100%). The range of hues, in this case, would take in seven tones: red, yellow (red plus green), green, cyan (green plus blue), blue, purple (red plus 100% blue) and magenta (red plus 50% blue), which can be perfectly associated with the notes of the diatonic scale Do-Re-Mi-Fa-So-La-Ti; further the notable circumstance arising that if the notes Do-Mi-So appear simultaneously (which is the basic fifth chord), the associated color would be the additive mixture of red, green and blue, which is equivalent to white.

For a chromatic musical scale, 12 colors would be made to correspond per octave. Finally, the white lamp at its four power levels will provide an increasing and repeated scale of more or less saturated hues. Thus, the musical octave Do (-1) to Ti (-1) can be represented by the above-mentioned tones without adding white light (i.e., in its saturated range), while a high octave Do (+2) to Ti (+2) is represented by the same color nuances, but this time with the strong addition of white (white lamp at 100%). Finally, it can be pointed out that the fountain microprocessor means, working in real time, perform a filtering of the musical signal to identify the note or notes present, and in accordance with the algorithm set forth above of music-color association, perform the regulated operation of each lamp.

A color organ can be created by placing in a cybernetic fountain a variable number of projectors of an infinity of colors according to the invention. As these projectors emit their light against the water, the nozzles and other elements, if they are able to support the light, provide an organ of colors, i.e., a scenario divided into independent color sectors.

It is possible to play with the colors on this organ in a way similar to playing with the sounds on musical instruments. Thus rhythmic color successions can be obtained: i.e., compositions in which the light runs along the entire scenario changing with as much rapidity as the musical sounds. On the color organ, it is possible to establish what can be called "color melodies."

The color-music correspondence, as the microprocessor means establish it, is one-to-one, so that, when a "color melody" is established, we can see the color of music, just as we can hear the music. This possibility opens up a field of scenic investigations of the greatest interest.

On the other hand, the applicant has found that the selective operation of the jets of his prior cibernetic fountain, in spite of being performed with some means for regulating the flow in which the basic characteristic is the gaining of negligible response times, is not sufficient at times to follow and display rapid rhythms when "presto" or "prestissimo" musical movements are reproduced. In order to provide a fountain having aesthetic effects which are able to interpret any musical piece dynamically, this creates a disadvantage due to the fact that, despite the practically zero inertia of the flow regulating valve, the jet participates in the inertia due to the effect of gravity. Thus, as a function of its height, the jet section released at a certain moment by the rapid action of the valve remains longer in its rising and falling trajectory that is desired to correctly represent such rhythms.

This problem has been solved by the applicant by the addition of a "rhythm conveyor." Since the valve element works with a permanently open flow, the constituent jets are kept constantly in service, while the rapid variation required in following the musical rhythm is produced by angular oscillation of the water output. This causes mechanical pulses to be applied to the water ejecting nozzle, and in this way the inertial effects due to gravity are avoided.

Out of the unit of jets that constitute the aquatic architecture of such cybernetic fountains, a variable group can be set aside, so that each group forms a rhythm conveyor. The pulsating movement of each rhythm conveyor is achieved by the fountain microprocessor means each time a musical accent is produced. On the other hand, the pulses of the different rhythm conveyors established in the fountain can be simultaneous among themselves or alternating, depending on the scenographic criteria, with the characteristic time of the interpreted musical piece being able to be represented in this way.

The works of the applicant have been embodied in new cybernetic ornamental fountains whose essential characteristics are discussed below in the Detailed Description as well as in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained below in greater detail with reference to a preferred embodiment illustrated in the accompanying drawings, in which:

Figures 1a and 1b represent operating sketches of a noncybernetic fountain of the prior art;

Figures 2a and 2b illustrate the operation of a cybernetic fountain according to Spanish Patent Application No. 8700079;

Figure 3 represents a block diagram that shows the operation of the cybernetic fountain of the present invention;

Figure 4 is a view in section of the solenoid valve used in the fountain nozzles of the invention;

Figures 5a and 5b illustrate in partial section in elevation and plan view, respectively, the arrangement of the lamps of a submersible projector used in the cybernetic fountain of the present invention;

Figures 6a and 6b represent a rhythm conveyor according to the present invention; and

Figures 7a and 7c represent the effects achieved with the rhythm conveyor illustrated in Figures 6a and 6b.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Figures 1a, 1b, 2a and 2b have already been described on the occasion of setting forth the prior art. The essential components of a cybernetic fountain according to the invention are detailed below with reference to the block diagram of Figure 3, in which are seen the blocking elements, also called individualized variable valves, T for each jet, light elements I, acoustic elements S, a microprocessor mP for controlling the fountain with its specific program, and hydraulic and electric means for connecting all the elements together.

In this figure, it is assumed that the necessary supplies of pressurized water AP and electric energy EE are available in the fountain. Variable valves T are connected to the water network by suitable connecting means at the same time they are connected to microprocessor element MP to which light element I and acoustic element S are also connected. Musical reproduction equipment EM provides suitable input or excitation signals for the microprocessor MP, which, following the instructions of specific program PR, works out the output signals for the synchronized control of the visible elements of the fountain.

In this embodiment, variable valves are available in sufficient number to provide the desired effects. Each of the valves will be characterized by water ejection means or nozzles, means for flow regulation (or variable stoppers) and means for control and electric connection to the microprocessor. Figure 4 represents by way of nonlimiting illustration a view in longitudinal section along the main axis of a valve which embodies the means for flow regulation according to the invention. This valve, of cylindrical symmetry, includes body (1) which incorporates a lateral mouth (2) for intake of the water, which is connected the discharge pipe of the cybernetic fountain. Inside said cylindrical body are two bearings (3) and (4) and a sealing jacket (5). All these elements can be disassembled (although for greater clarity this feature has not been shown in the drawing) to allow maintenance or replacing of the remainding parts of the valve and water nozzle. The body ends at the upper part in a water output mouth (6) to which is connected the ejecting nozzle which produces the jet of the fountain which is controlled by this valve.

The water flow follows the path marked by the arrows, from intake mouth (2) to output (6). Bearing (4) is fastened to body (1) by rods or spokes with a small section to allow the free passage of the water through this zone. The stopper mechanism, independent of the body, is a sliding unit that is made up of a plug (7) solidly united to shaft (8) and to ferromagnetic core (9). In the closed position, which is represented in Figure 4, plug (7), by the action of spring (10), is pressed against the seat of valve orifice (11), so that the flow is cut off, since there is no communication between intake cavity (12) and output cavity (13). This stopper unit slides on bearings (3) and (4).

The control device consists of an electromagnetic coil (14) hermetically encapsulated in a can (15) which is fastened to body (1). Electric cables (16) go out through suitable glands (17) and are connected to the fountain control equipment by the microprocessor. As long as there is no voltage in the coil, the valve remains closed by the action of spring (10). When the coil is excited, core (9) is attracted with a force greater than that of the precompression of the spring, therefore the core (9), shaft (8) and plug (7), are displaced to the open valve and allow the water to flow from cavity (12) to (13) through orifice (11).

Another feature of this valve is constituted by axial orifices (18) made in plug (7), so that, in any position of the valve, cavity (13) will remain hydraulically connected to cavity (19) which defines the inside of jacket (5). In this way, the pressures on both faces of the plug are practically the same, and the operation of the valve remains independent of the operating conditions of the pressures existing in the fountain. In the contrary case, the static forces would represent a variable resistance of considerable magnitude, incompatible with the direct control selected for this valve. Obviously, cavity (19) should remain isolated from (12), since in the contrary case there would be a notable passage of water through orifices (18). The closing takes place on small facing surface (20) between jacket (5) and plug (7). Here also is another very important characteristic of the valve: seal (20) is not completely hermetic to avoid clogging and friction produced by the particles carried by the water of a fountain, which, inevitably, is not free of dirt. The play existing in seal (20), which is essential for the correct operation of the valve, is compatible with the esthetics of the fountain, since, although the seal is not complete, the small flow that can escape through this play does not cause an appreciable height in the jet, so that it appears "closed" to the observer.

On the other hand, it can be pointed out that the only reactions to the movement of the valve are the static ones produced on the bearings and the dynamic ones of the water on the plug, both perfectly compatible with direct control, which provides minimum response times in keeping with the aesthetic effects which are expected in a cybernetic fountain.

Figures 5a and 5b illustrate a submersible projector according to the invention in which the lamps are grouped around the vertical axis of symmetry, (21) being the casing of the projector, (22) the sealing glass, (23) the gasket, (24) the tightening flange provided with bolts, (25) the lampholders, (26) the power supply cables, (27) the output glands of the conductor, (28) the red, (29) the green, (30) the blue and (31) the white lamp.

Figures 6 and 6b represent a rhythm conveyor according to the invention, the first being a view in section and the second a plan view. Two vertical rows (32) of water jet rise from corresponding nozzles (33) provided with an elastic collar (34), said nozzles being joined together by a flange (35), while the base of the elastic collar is connected to each of stationary distribution pipes (36) which in turn are connected to pressurized water discharge (37) which comes from the fountain pump. Two submersible electromagnetic units (38), consisting of two coils, each working in opposition to the other, alternately draw rods (39) and (40), solid with flanges (35), by the upper end, thus causing an alternating movement of the two jet rows.

Figures 7a to 7c represent the effects attained with this device. Figure 7a corresponds to the verticality of the two rows of jets, being able to be defined as a position of equilibrium. Figure 7b corresponds to the position of activation by the arrival of an electric pulse to the electromagnet synchronously with each accent of the music. In this way, an inclination of the nozzles is originated and, consequently, provides a crossing of the two rows of jets in space to form intertwined arcs of parabola. It should be noted that when the rhythm conveyor is represented in a front view, only the jets of the first plane are drawn. The rest of the jets take the same trajectory contained in successive planes parallel to that of the drawing. In a perspective view, the depth dimension of this device would appear. Finally, Figure 7c, in contrast with the static characteristic of Figures 7a and 7b tries to represent the dynamism that is obtained with the rhythm conveyor, when it is excited by a rapid succession of pulses corresponding to a "prestissimo" musical movement. From this view, it is not difficult to imagine the scenic effect of representation of rhythm and time that can be obtained with various rhythm conveyors suitably located in a cybernetic fountain unit.

As can be seen from the above description, the constructive details of the fountain of the invention, such as the absence of rigorous mechanical fittings, the appreciable play between its moving parts, especially on the blocking surfaces, and the simplicity of operation, clearly distinguish the system of the invention from any other known system and characterize it as totally suitable for achieving the aesthetic effects sought in the cybernetic fountains.

Finally, it can be pointed out that the description given here corresponds to a preferred embodiment of the invention, by no means limiting, since the fountain described or illustrated can adopt other forms with identical functionality, the essential characteristics being maintained which are claimed.

Claims

1. An ornamental cybernetic fountain that comprises a plurality of nozzles which each have a liquid intake and a liquid output and are intended to allow a stream of liquid to flow through, a system for control of the flow of said nozzles and one or more pieces of spectacular decorative equipment coordinated among themselves, the control of the flow of the nozzles being individualized and each being governed by the microprocessor means, characterized in that the flow control system of the nozzles consists of a valve adapted to vary the flow of said stream of liquid through the nozzles, which comprises generally a cylindrical body member that has an intake cavity, an output cavity and a valve bore between them to establish communication of the flow of liquid between said cavities, means to control selectively the flow of liquid through said valve bore, which comprise a plug member that can be moved along a central shaft of said valve between a closed position, in which said plug substantially prevents the liquid from passing through said valve bore, and an open position in which a predetermined amount of liquid circulates through said valve core, means to pull said plug member toward said closed position, and means to move said plug to said open position to allow said predetermined amount of liquid to circulate through said valve bore, said movement means including an electromagnetic controller able to provide forces to move said plug to any of a plurality of positions, each of which allows a different amount of liquid to circulate through said valve bore, so that, when said valve bore is open a predetermined amount of liquid circulates through said valve bore and comes out through said output cavity; and in that decorative, spectacular piece or pieces of equipment consist of one or more rhythm conveyors and one or more submergible projector units, each rhythm conveyor consisting of a group of jets, variable in number, which is selected from the

unit of jets that constitute the aquatic architecture of the fountain and whose mission is to display the rhythm of a determined musical piece which is reproduced in synchronization with the fountain, said display of the rhythm being achieved through a pulsating movement of the jets of the rhythm conveyor each time a musical accent is produced, while the pulses of the different rhythm conveyors established in the fountain can be simultaneous among themselves or alternating, thus further providing a representation of the time of the musical piece, and each of the submergible projectors of said projector units consisting of four lamps of red, green and blue, supplied electrically with control of continuous and individualized power.

2. A fountain according to claim 1, wherein said valve plug member includes one or more axial holes to equalize the pressure of the liquid on both sides of said plug member to allow the opening and closing of the valve, independently of the pressure of the liquid in the nozzle.

3. A fountain according to claim 2, wherein said plug member is mounted on a shaft, one end of which extends through said valve bore and the other end of which includes a ferromagnetic core controlled by said electromagnetic controller.

4. A fountain according to claim 1, wherein said output end of said nozzle further comprises a spray head to create a predetermined pattern or flow effect.

5. A fountain according to claim 1, wherein said stress means includes a spring.

6. A fountain according to claim 5, wherein said spring is protected by a jacket from exposure to said liquid flow, one end of said jacket including said plug member and a partial seal between said plug member and said jacket.

7. A fountain according to claim 6, wherein the plug member includes at least one axial hole to equalize the pressure of the fluid in said jacket with the pressure prevailing on the opposite side of said plug member.

8. A fountain according to claim 6, wherein said seal has a hole sufficient to prevent residues in the form of particles from interfering with the movement of said plug member between its open and closed positions.

9. A fountain according to claim 3, wherein said shaft is mounted between at least two bearing members to allow an axial movement of said shaft and said plug member between said open and closed positions.

10. A fountain according to claim 3, wherein said electromagnetic controller includes an electromagnetic coil which, when a potential is applied, is able to move said ferromagnetic core to any of a plurality of positions to compensate for the force supplied by said stress means, thus opening the valve bore to allow a predetermined flow of liquid through it.

11. A fountain according to claim 10, wherein said electromagnetic coil is designed so that application of said potential results in the plug member varying between an open position for the maximum flow of fluid through said valve bore and a substantially closed position.

12. A fountain according to claim 1, wherein an effect produced by at least one piece of decorative equipment, operationally associated with said microprocessor means, is coordinated with said liquid flow.

13. A fountain according to claim 12, wherein the piece or pieces of decorative equipment are at least one light point, a musical apparatus or a laser beam projector.

14. A fountain according to claim 5, wherein said microprocessor means are programmed to allow application of a potential to said electromagnetic coil to generate a force of greater magnitude than that of the precompression of the spring to move said plug member, thus opening said valve bore.

15. A fountain according to any of the above claims, wherein said rhythm conveyor consists of two vertical rows of jets which rise from orientable nozzles mechanically operated by an electromagnet or other submergible electromechanical means, whose equilibrium position corresponds to the verticality of the two rows, while the position of activation by the arrival of an electric pulse to the electromagnet, synchronously with each accent of the music, corresponds to the inclination of the two rows, the respective jets crossing in space and this movement being performed according to 2/2, 3/4 rhythm, etc., corresponding to the movement of the musical notes, thanks to the control provided by said microprocessor means.

16. A fountain according to any of the above claims, wherein each projector is designed so that, as a function of the power assigned to each of its red, green, blue and white colored lamps or provided with the corresponding filters, the basic range of colors obtained by additive mixture are provided, preferably consisting of red, yellow, green, cyan, blue, purple and magenta, in case of correspondence with the diatonic musical scale or of twelve colors per octave if the chromatic scale is used, these colors being obtained with distinct degrees of saturation of each color or of white as a function of the variable mixture of light to be associated with each octave of the musical scale, and the control of the power that defines the light of each projector being achieved with said microprocessor means.

17. A fountain according to any of the above claims, wherein it includes a color organ intended to establish a music color correspondence associating with each musical note of the diatonic or chromatic scale a color of the light spectrum, the same notes of different octaves being distinguished, from the lowest to the highest, by the distinct degree of saturation of color associated with them, so that low Do of the first octave of the piano will be represented by a saturated red, while the highest Do will have associated the same color with an abundant mixture of white, i.e., the same nuance of color, but with less

degree of saturation; this correspondence being materialized by light projectors of the fountain, which provide said chromatic scales on the basis of an additive mixture of colors as a function of the notes coming from musical scales.

FIG:- 1a

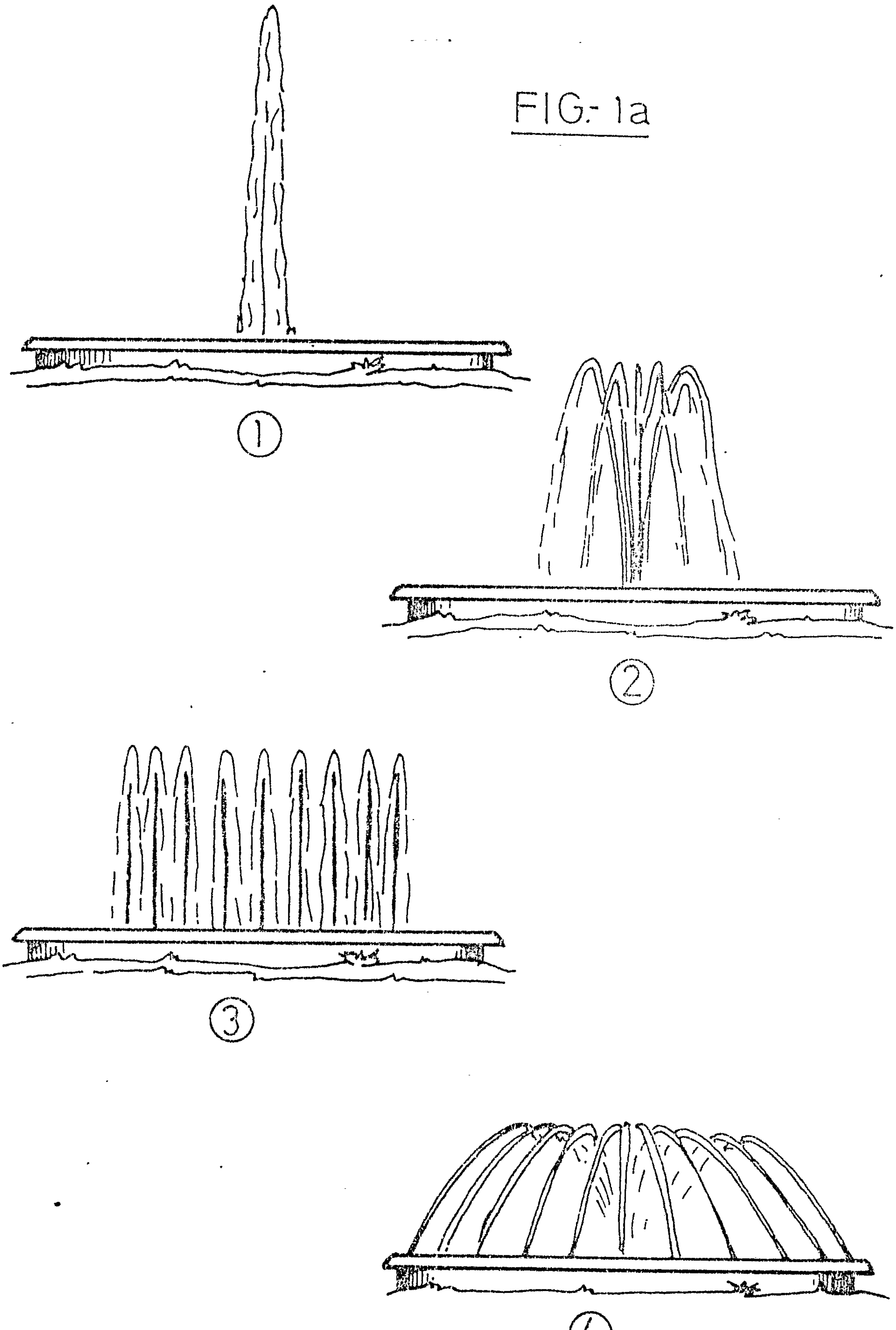

FIG.- 1b

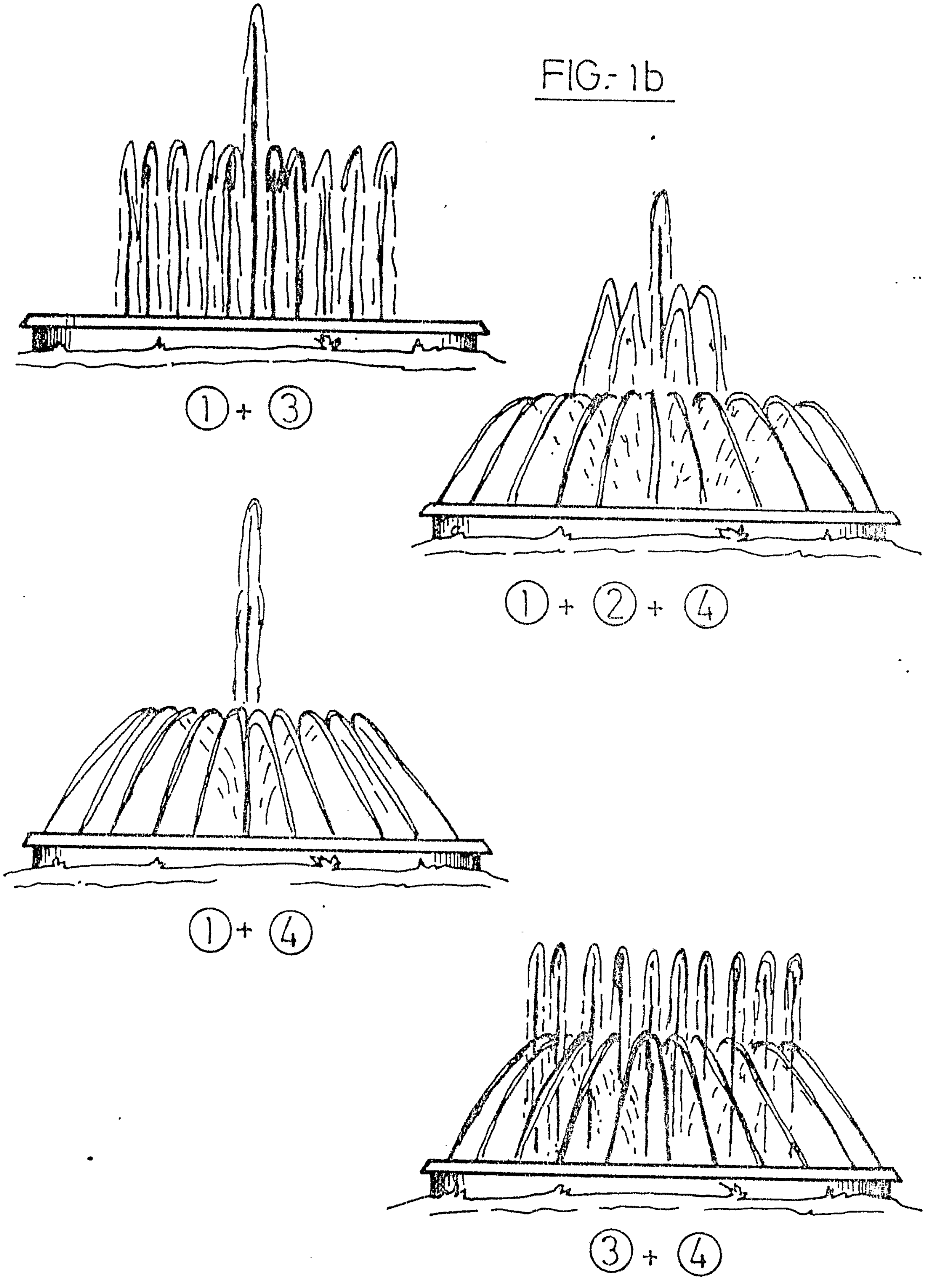

FIG.- 2a

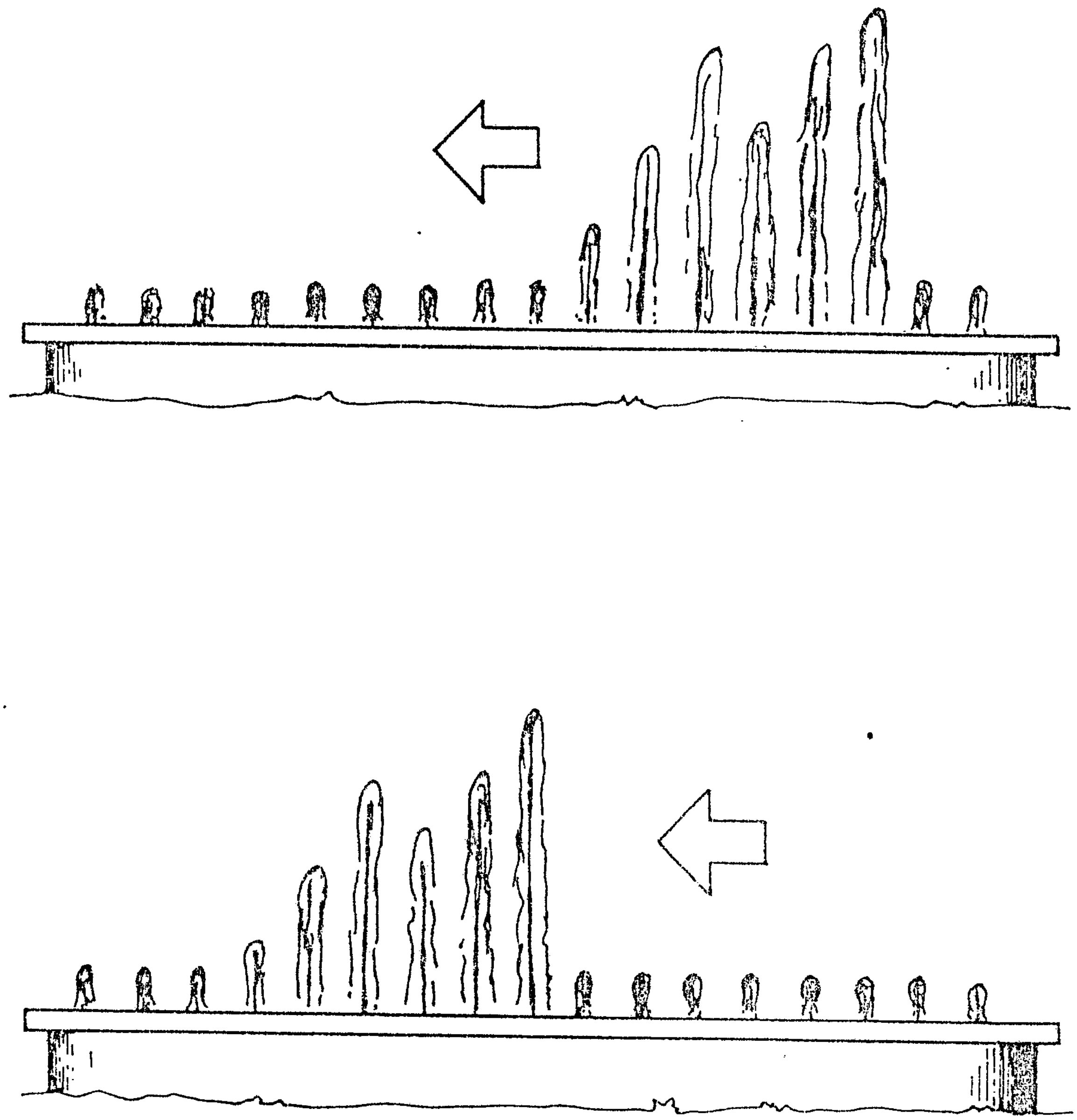

FIG.- 2b

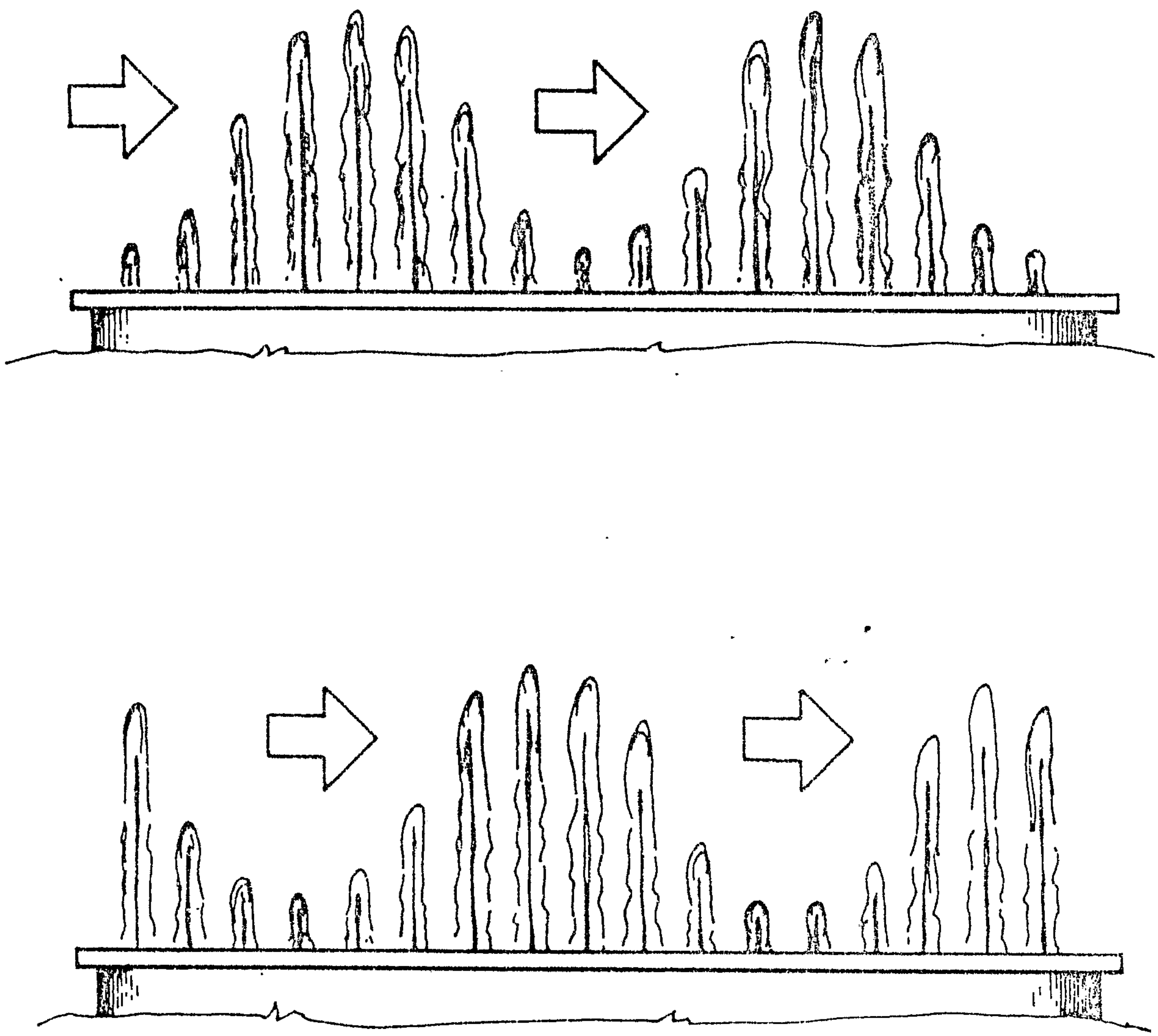

FIG.- 3

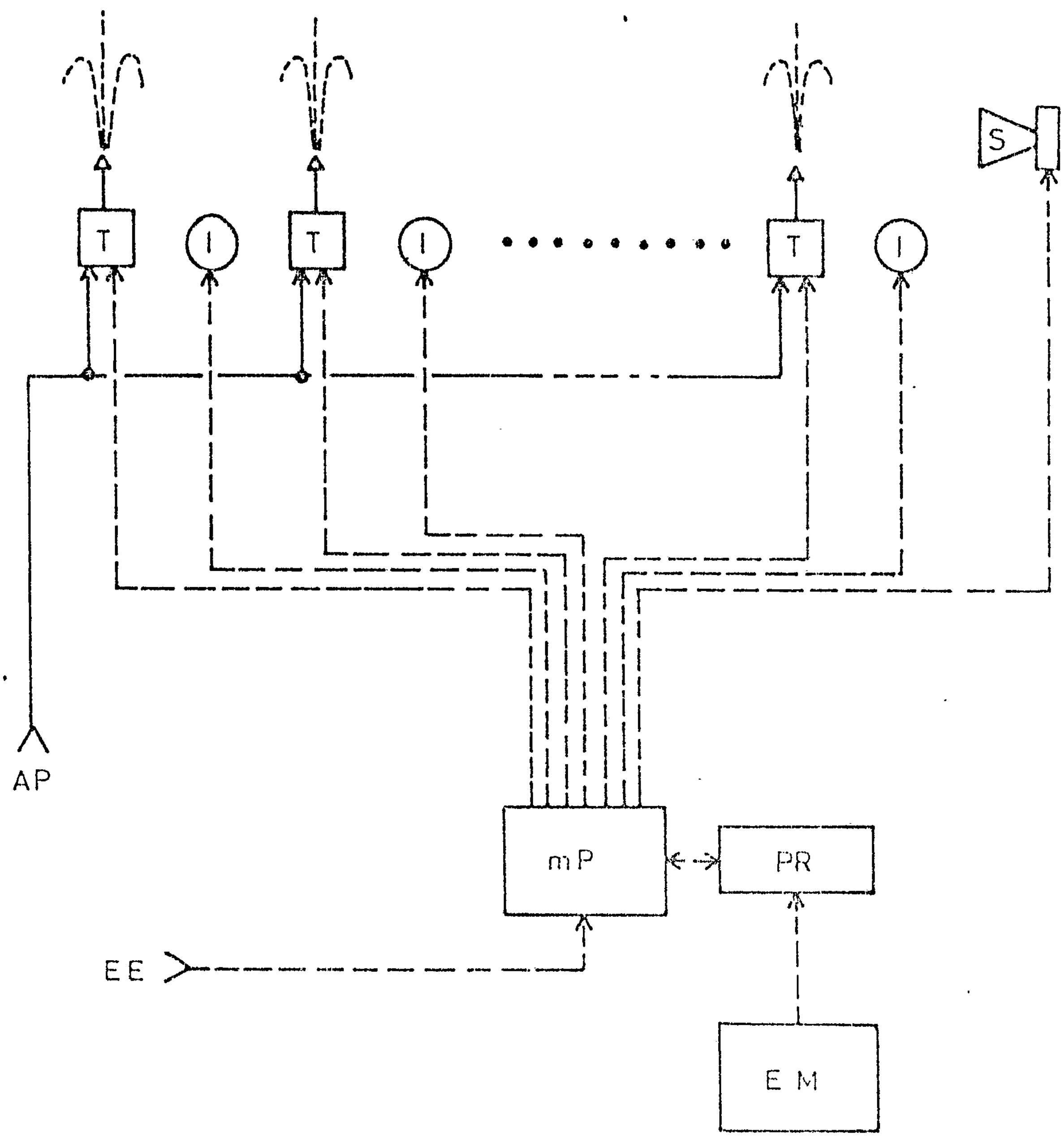

FIG.-4

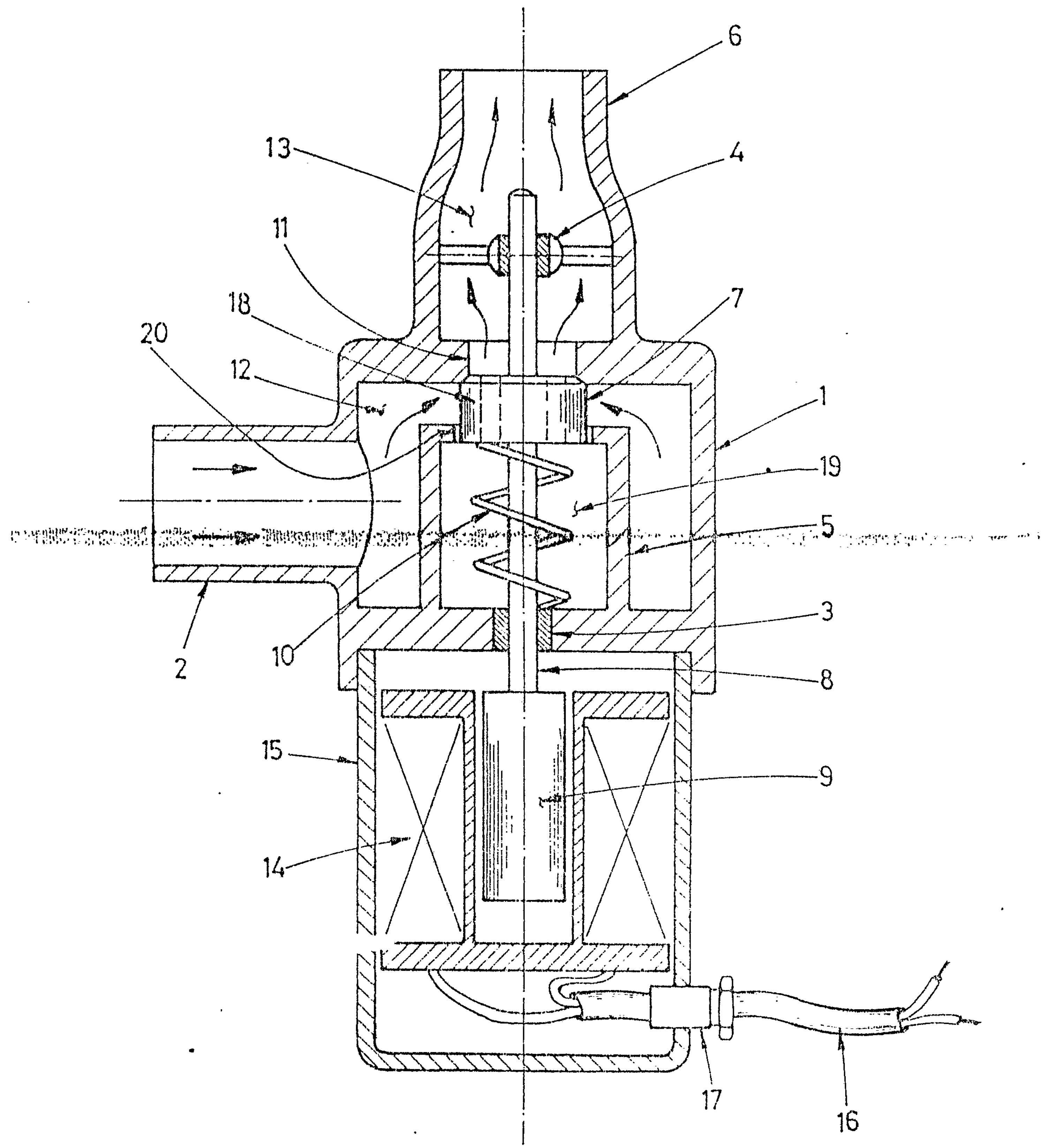

FIG.-5a

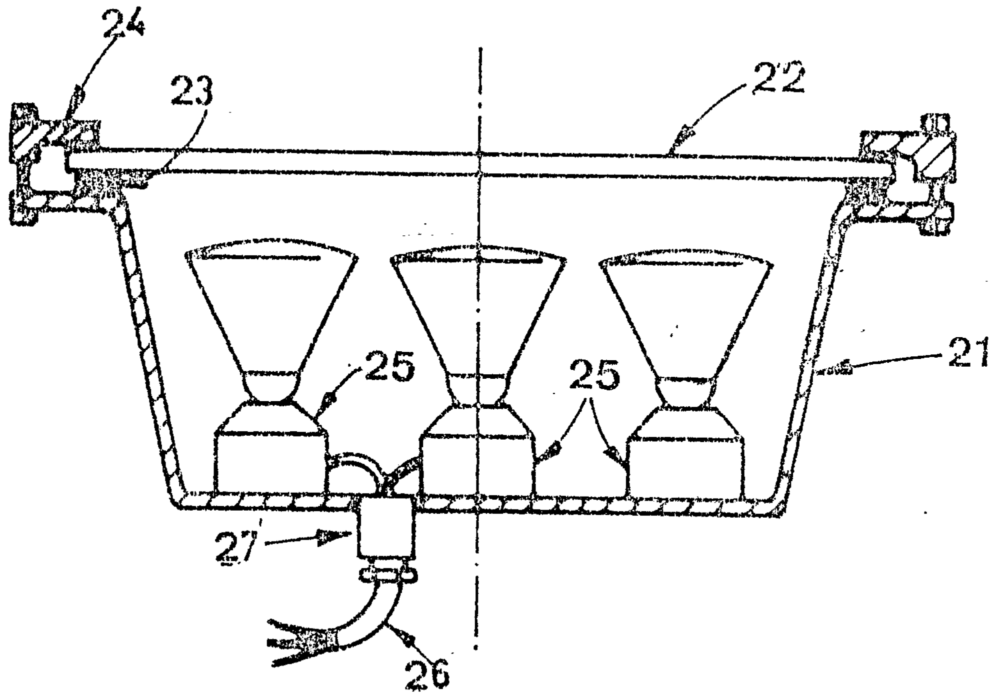

FIG 5b

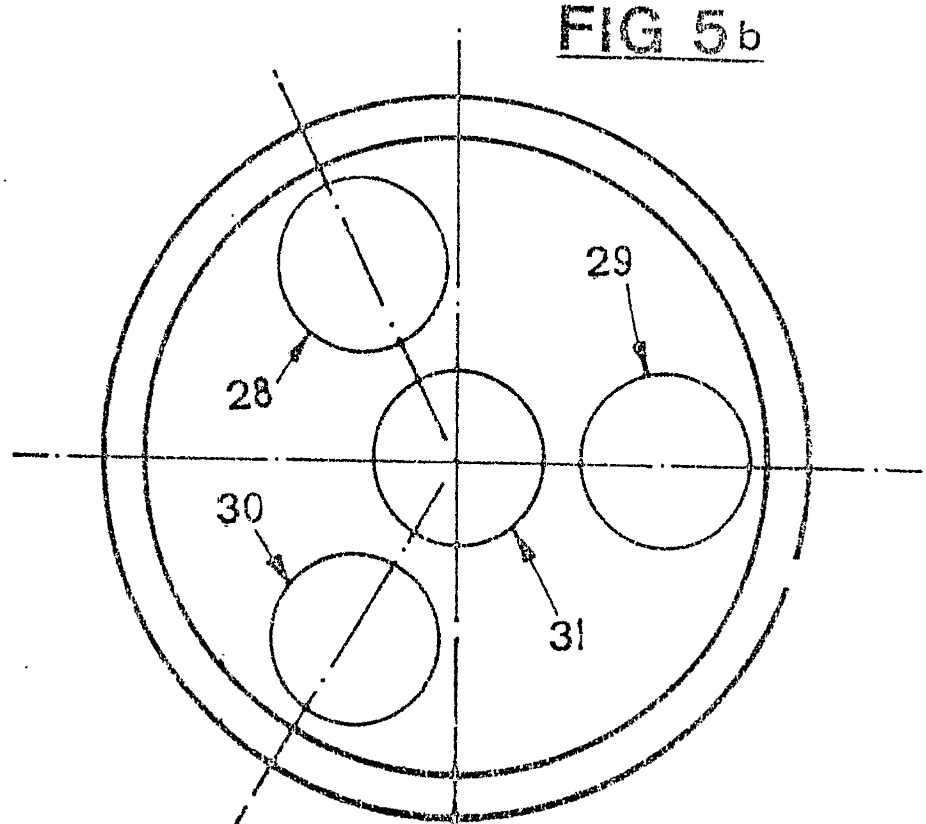

FIG.-6a

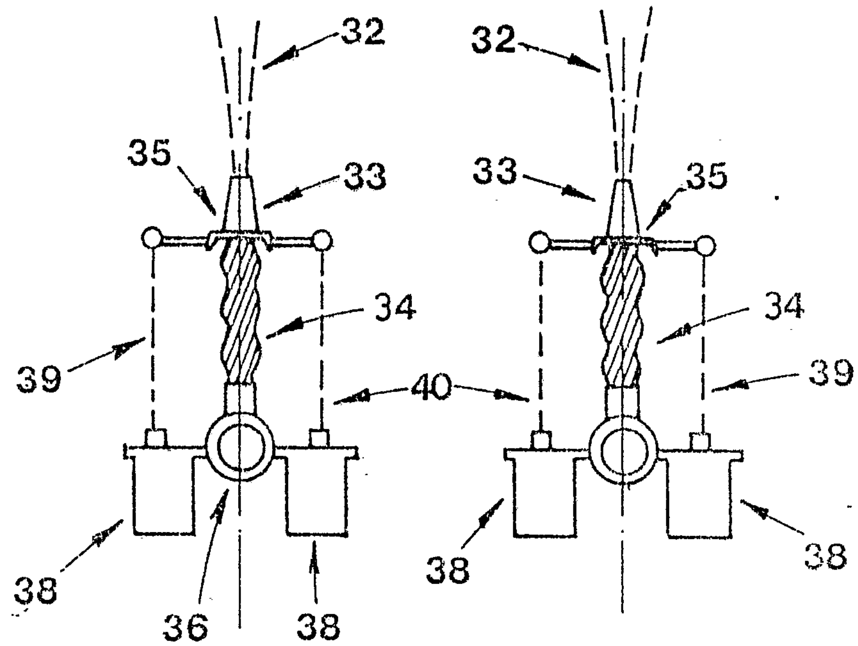
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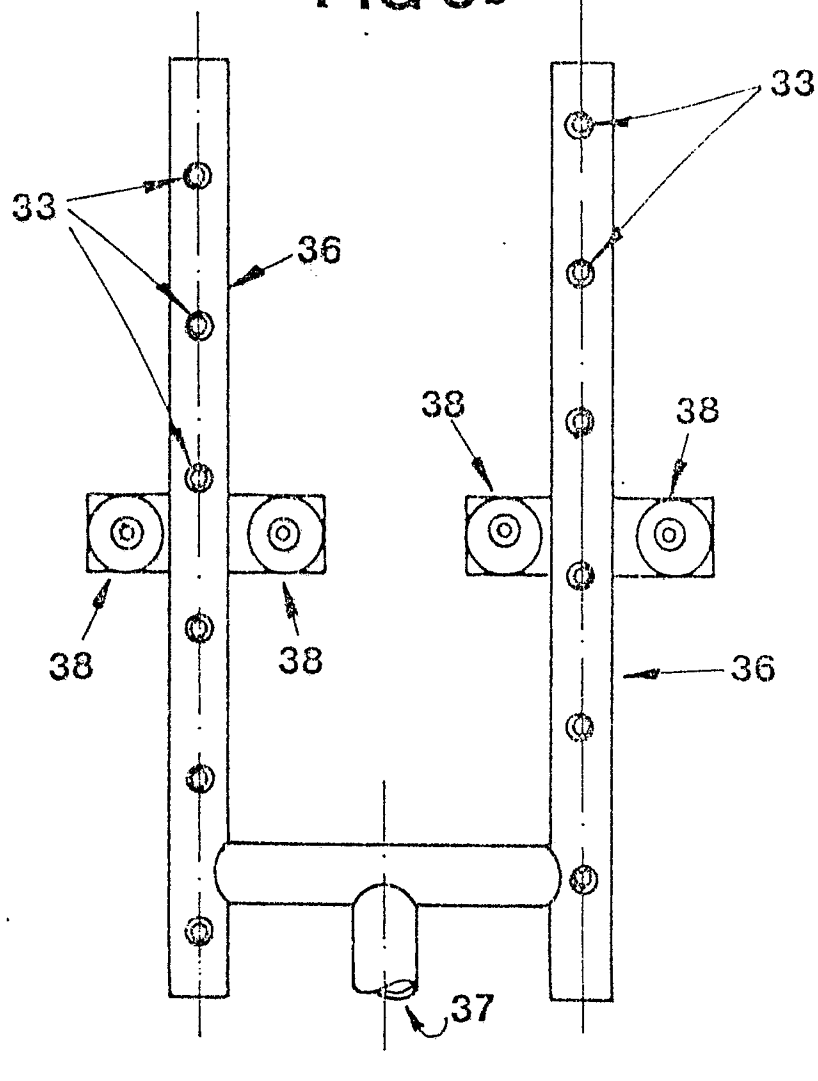
FIG 6b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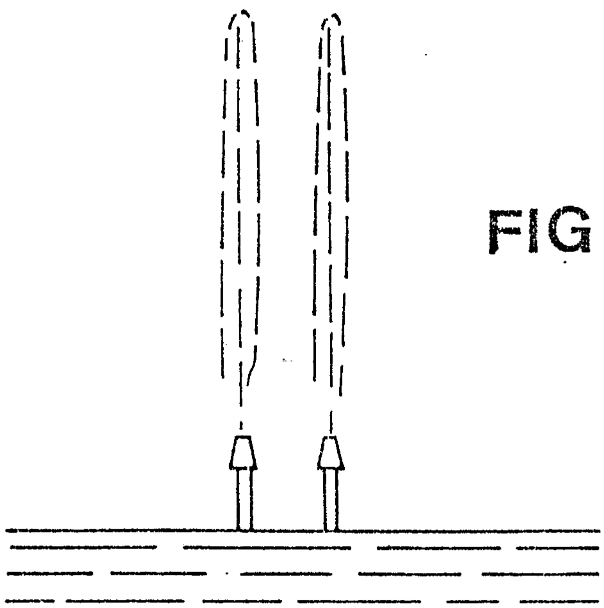

FIG 7a

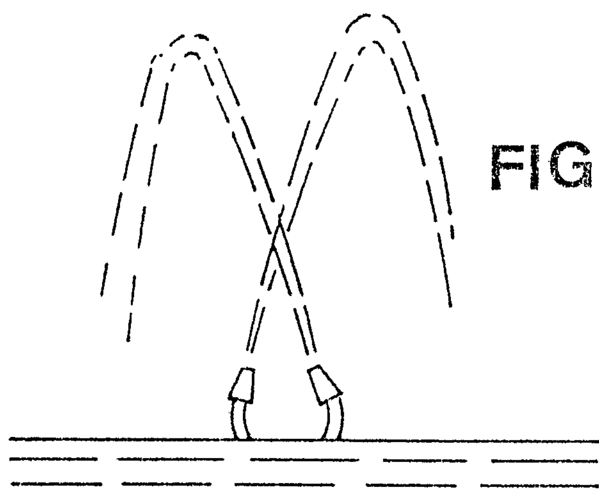

FIG7b

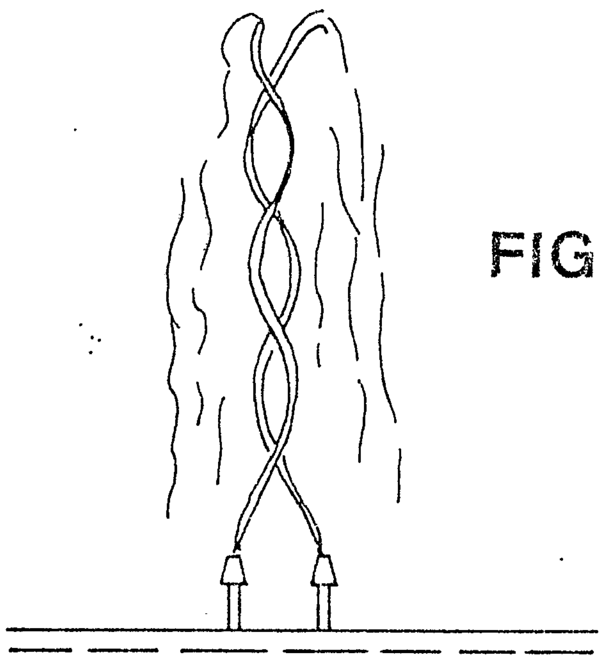

FIG 7c