

Oct. 26, 1937.

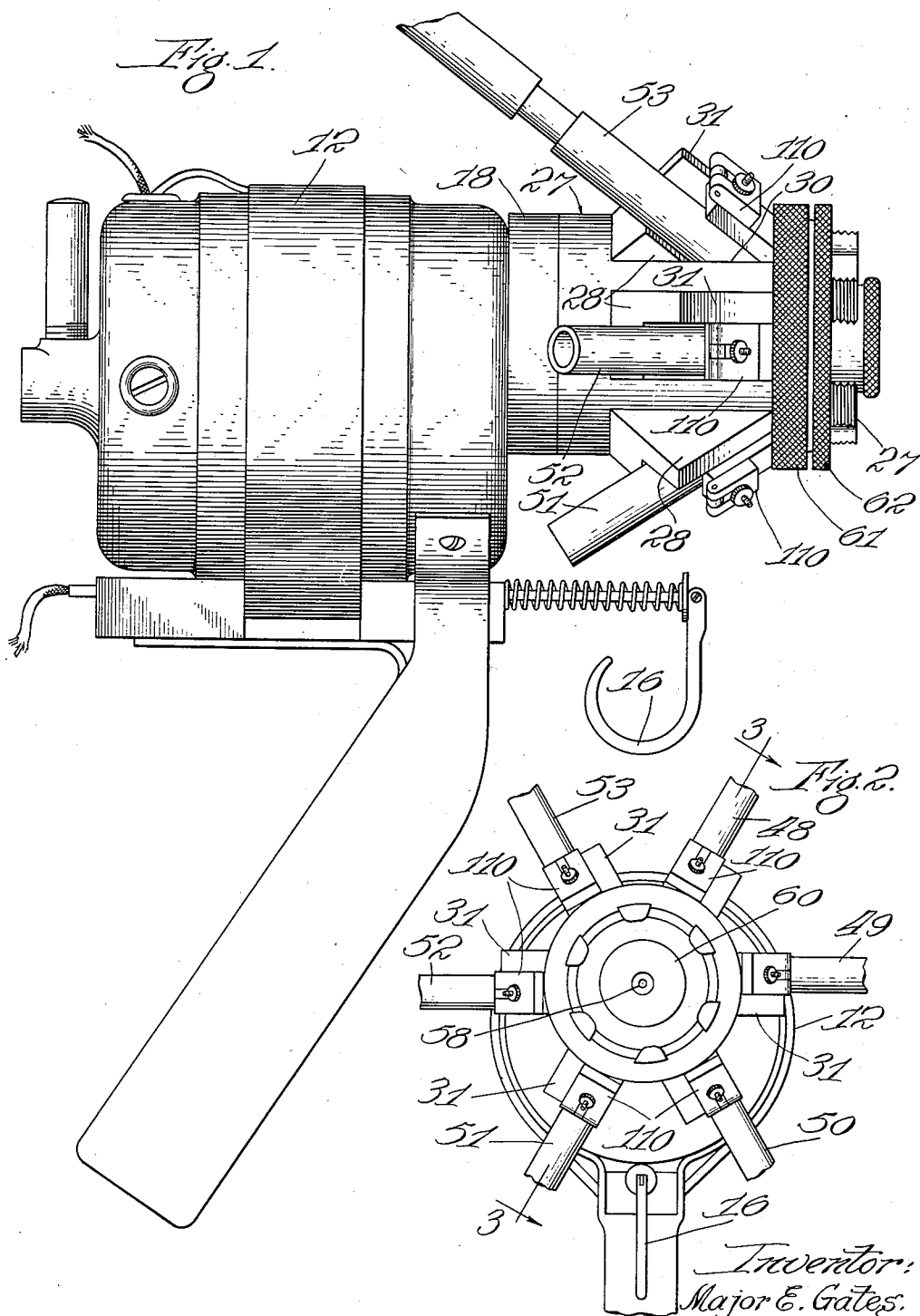
M. E. GATES

2,097,028

FLUID CONTROLLING DEVICE

Filed March 30, 1934

4 Sheets-Sheet 1



Inventor:
Major E. Gates.
By Dymforth, Lee, Chittenden & Wilks.
Attys.

Oct. 26, 1937.

M. E. GATES

2,097,028

FLUID CONTROLLING DEVICE

Filed March 30, 1934

4 Sheets-Sheet 2

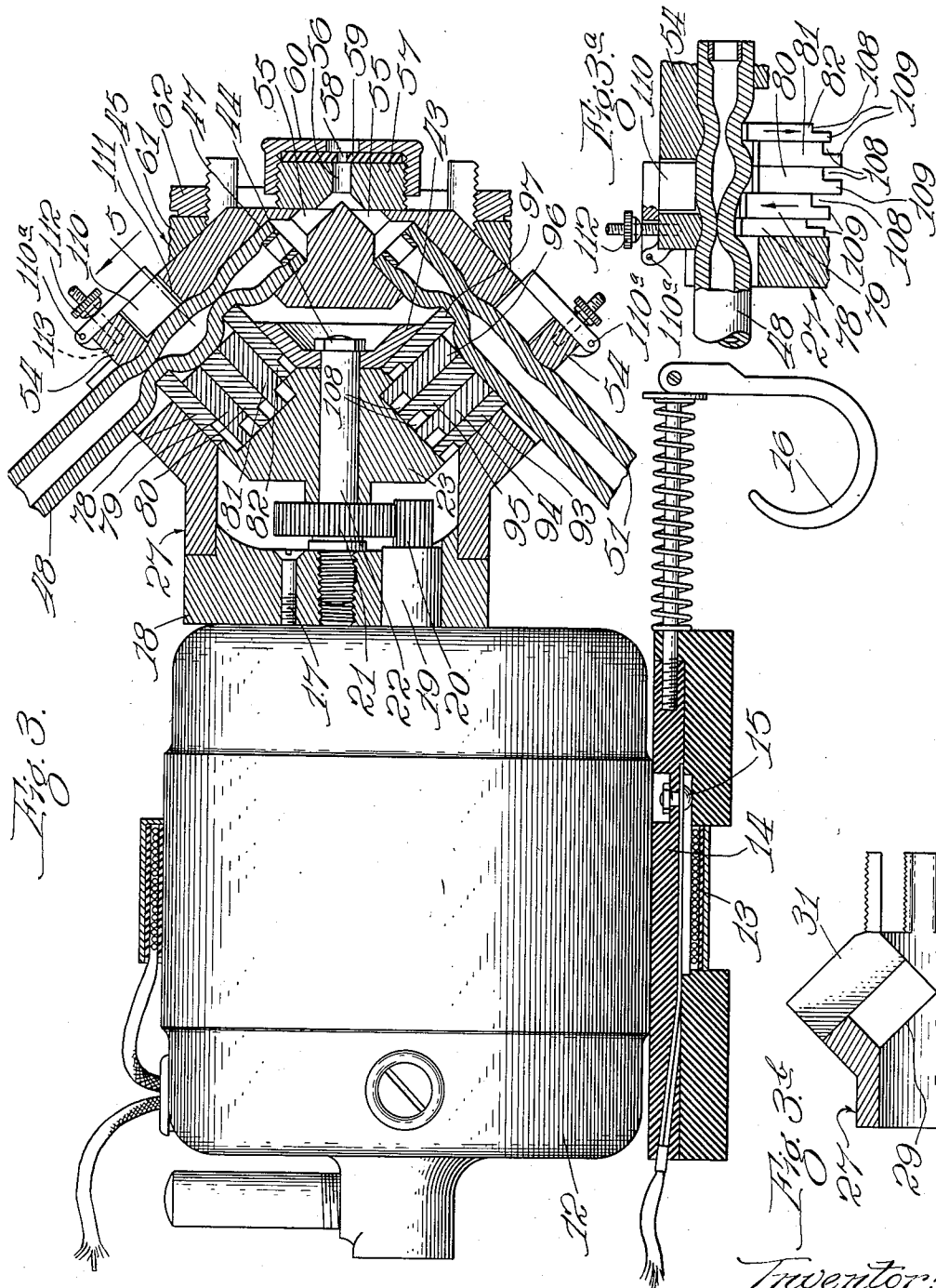


Fig. 3.

Fig. 3a.

Fig. 3b.

Inventor:
Major E. Gates.
By Dyrenforth, Lee, Chittor & Wills
Attys.

Oct. 26, 1937.

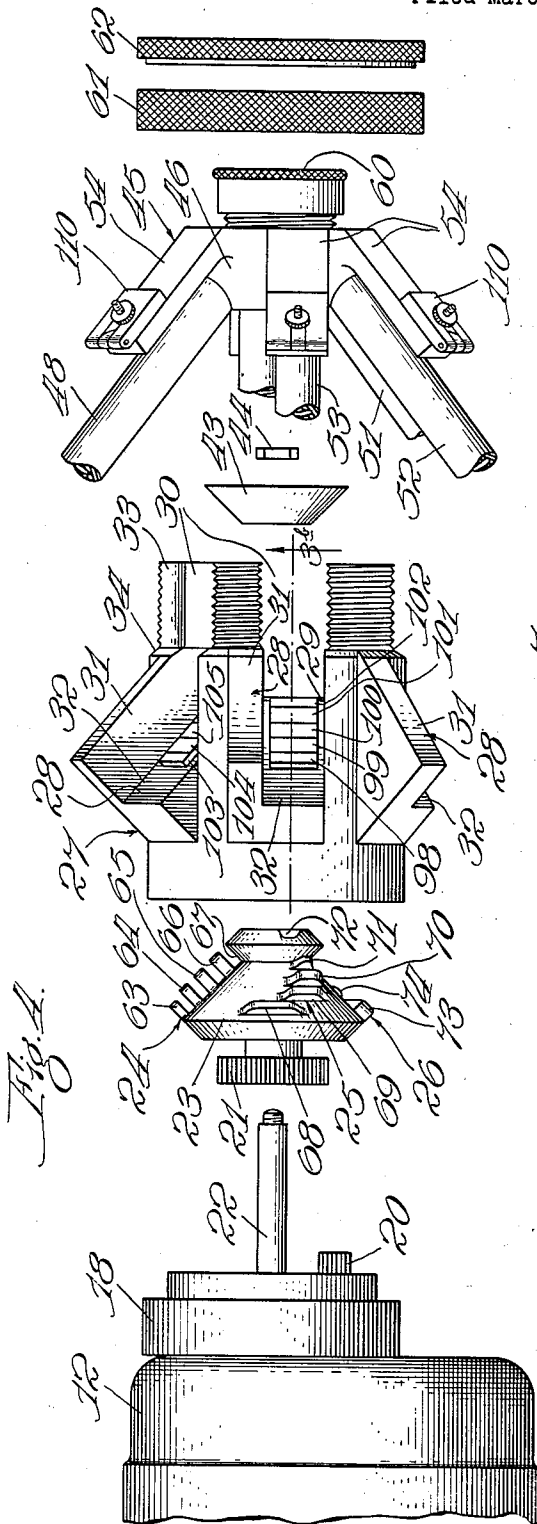
M. E. GATES

2,097,028

FLUID CONTROLLING DEVICE

Filed March 30, 1934

4 Sheets-Sheet 3



Oct. 26, 1937.

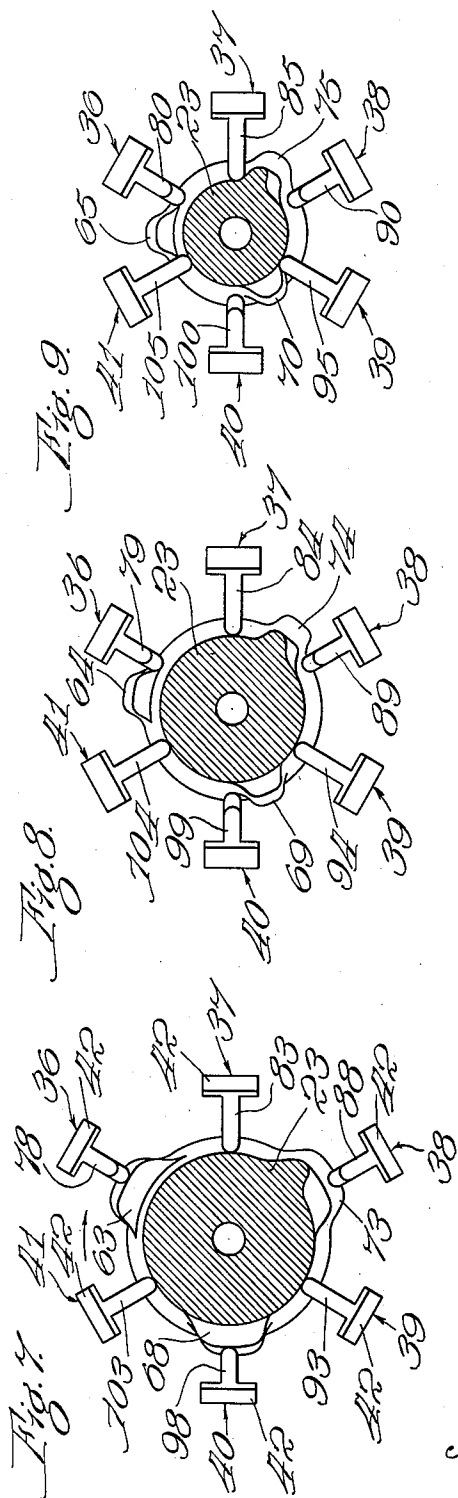
M. E. GATES

2,097,028

FLUID CONTROLLING DEVICE

Filed March 30, 1934

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,097,028

FLUID CONTROLLING DEVICE

Major E. Gates, Crystal Lake, Ill.

Application March 30, 1934, Serial No. 718,281

8 Claims. (Cl. 91-44)

My invention relates, more particularly, to devices for producing the flow, in a desired manner, of fluids, it having been devised for use, more particularly, but not to the exclusion of other uses, in the manufacture of surfacings presenting a mottled, or speckled, appearance and produced by the projection of bodies of coating fluid against the object on which the surfacing is to be produced, as for example terra cotta blocks, the best effects being obtained by applying to the foundational body on which the surface is to be produced, the material to produce the speckled, or mottled, effect, by an intermittent discharge of such material against the foundation, this being accomplished by the use of my invention.

One of my objects is to produce the intermittent, or pulsating, action referred to, under the control of the operator and to provide for such action by a novel, simple and economical construction of device which by preference may be caused to discharge a plurality of coating fluids, as for example of different colors or tones against the body to be surfaced.

Another object is to provide for either the successive discharge of streams of separated bodies of the fluid or the simultaneous discharge of streams of different materials, as for example different colors or tones; and to provide means whereby many different combinations of different streams may be produced at the will of the operator, all by a constantly maintained measured flow; also to provide for the varying of the quantity of the fluid projected from the device at each pulsation.

Another object is to cause the fluids, where a plurality are used of different colors or tones, to be projected against the object in separated bodies under such conditions that the bodies at intervals on the object will be caused to be relatively grouped, thereby to produce a mottled, or speckled, effect which may be observed from a considerable distance. Another object is to produce a multi-colored surfacing which shall present an appearance of relatively great depth, closely resembling the appearance presented by a body of non-surfaced material and presenting a speckled, or mottled, effect.

Another object is to provide a device by which the desired blending of the bodies on the foundation may be effected without requiring that the foundation be wet and without great skill or care on the part of the operator.

Another object is to provide in a single nozzle device through which a plurality of pulsating streams of fluid of different character, as for ex-

ample of different colors or tones, are projected by pumping mechanism operating against flexible tubes, for controlling or preventing reverse flow of the fluid from the outlet toward the pumping mechanism to control or prevent intermixture of the different fluids from this cause; and other objects that will be manifest from the following description.

Referring to the accompanying drawings:

Figure 1 is a view in side elevation of a fluid-controlling device embodying my invention.

Figure 2 is an end view of the device viewing it from the right-hand side of Fig. 1.

Figure 3 is a view like Fig. 1 and of the device therein illustrated, showing a portion of the mechanism in section the main portion of which is taken at the line 3 on Fig. 2 and viewed in the direction of the arrow.

Figure 3^a is a fragmentary view like Fig. 3 but showing the presser-devices in a different position. Figure 3^b is a broken section taken at the line 3^b on Fig. 4 and viewed in the direction of the arrow.

Figure 4 is a view like Fig. 1 and of the parts shown therein, showing these parts in disassembled, yet related, positions and illustrating the order in which they are assembled.

Figure 5 is a broken enlarged sectional view taken at the line 5 on Fig. 3 and viewed in the direction of the arrow.

Figure 6 shows enlarged views in side elevation of the cam-device for operating the presser-devices, the device being shown as split into several sections to better illustrate the construction; and

Figures 7 to 11, inclusive, are sectional enlarged views of the cam device taken at the lines 7 to 11, inclusive, respectively, on Fig. 6 and viewed in the direction of the arrows, these views also showing the several presser-devices cooperating therewith, the cams and presser-devices being shown in the relative positions they occupy when the cam-device is in the position shown in Fig. 3.

The particular construction of device illustrated comprises an electric motor 12 shown as having interposed in the wires conducting current thereto for its operation, a speed-controlling mechanism shown as comprising a rheostat coil 13 and a slidable contact member 14 in series in the motor circuit, the contact member 14 having a contact-boss 15 which is slidable along the coil 13 under the control of the operator manipulating the contact member 14 at a finger-grip portion 16 thereon.

Secured to one end of the motor 12, as by

screws one of which is shown at 17, is a plate 18 through which the armature shaft 19 of the motor, extends the outer end of the shaft 19 carrying a pinion 20 which meshes with a gear 21 journaled on a stud 22 carried by the plate 18. Rigid with the gear 21 is a head 23 of general frusto-conical form and equipped at its periphery with a plurality of sets of cam-portions shown as three in number and represented generally at 24, 25 and 26, the construction and arrangement of these cam-portions being hereinafter described.

Mounted on the outer shouldered end of the plate 18 is a hollow frame member 27 of general cylindrical shape, and provided, at equally spaced intervals, about its circumference with triangular shaped radially-disposed projections of a number corresponding with the number of sets of presser-devices hereinafter described, and at its interior surface with a forwardly projecting hollow frusto-conical flange 29.

The member 27 is longitudinally slotted at its outer end in the planes of the several projections 28 as illustrated at 30, these slots extending part way through the projections 28 in a rearward and upward direction whereby the projections 28 are caused to present side flanges 31 and downwardly and forwardly inclined slot-bottom-forming surfaces 32, the front, outer, end of the member 27 having a reduced threaded terminal portion 33 adjacent a continuous shoulder 34. The member 27 at each inclined surface 32 is slotted lengthwise thereof radially therethrough and through the forward ends of these surfaces as represented at 35, and in each of the slots 35 is a series of slidable presser-devices, six series thereof being shown at 36-41, inclusive, and each series extending generally lengthwise of the member 27.

The presser-devices of each series thereof and which are headed as represented at 42 extend at their inner ends into position to be engaged by the cam-portions on the cam-head 23 as hereinafter described.

The member 27 and cam-head 23 are held in the positions shown in Fig. 3 by a frusto-conical shaped member 43 which opposes the outer end of the head 23 and abuts the outer end of the flange 29, a nut 44 on the stud 22 holding the member 43 in place.

45 represents a spider presenting a central hub-portion 46 having sockets 47 in which the outer ends of flexible tubes 48-53, inclusive, preferably heavy flexible rubber tubing, are secured, these sockets and tubes inclining forwardly and toward the central axis of the hub 46 and equidistantly spaced around the axis whereby in the assembled condition of the parts the tubes 48-53 are caused to extend into the several slots 30 and overlie the several series of presser-devices, respectively.

The arms of the spider, represented at 54, correspond, in number, to the number of tubes 48-53 with which they are respectively aligned whereby these arms extend, respectively, over the tubes, to form backings therefor to resist outward deformation of the tubes under the action of the presser-devices operating against them as hereinafter described.

The sockets 47 in the spider 45 open into passages 55 in the hub which converge to, and open into, a central passage 56 of a nozzle member 57 which opens into an orifice 58 in a plate 59, preferably of soft rubber, and held in place on the member 57 by an apertured cap-plate 60.

The spider 45 is held in place by a chamfered ring 61 embracing the arms 54 and screwed upon

the threaded portions 33 of the member 27, a lock-ring 62 holding the ring 61 against displacement.

The tubes 48-53 are provided for conducting the fluids to be projected by the device, such as coating fluids of different kinds such as for example different colors or tones, and which would lead from any suitable sources of such fluids. The sources of fluids are not shown but the material may be caused to either flow to the device or be drawn to the latter by the action of the presser-devices as desired. Thus the fluids may be provided in receptacles arranged either above the device in which case the material would flow to the device under a head, or on substantially the same level as the outlet ends of the tubes, or below such level and in the two latter instances provision may, or may not, be made, as desired, for forcing the fluids to the device.

Referring now to the particular cam-head shown, each series 24, 25 and 26 of cam-portions comprises five cam-portions, the cam portions of series 24 being represented at 63-67, inclusive, the cam-portions of series 25 at 68-72, inclusive, and the cam-portions of series 26 at 73-77, inclusive, the cam-portions 67, 72 and 77 being shown as comprising notches in the small circular terminal end of the cam-head. The cam-portions of series 24 and 25 are spaced apart in the direction of the length of the cam-head and are disposed in staggered relation to each other as represented in Fig. 4, the cam-portions of series 26 being of a thickness equal to twice the thickness of the cam-portions of series 24 and 25, and arranged circumferentially in line therewith. The presser devices of the series 36-41 are illustrated at 78-82, inclusive, 83-87, inclusive, 88-92, inclusive, 93-97, inclusive, 98-102, inclusive, and 103-107, inclusive, respectively, the inner ends of the several presser-devices of the series 36-41 thereof being notched at their sides as represented at 108 to present terminal portions 109 of a width equal to one-half of the thickness of the cam-portions of series 26. The presser-devices are adapted to be positioned in the slots 35 with their notches 108 facing in either direction lengthwise of the cam-head and thus for cooperation with either of the series 24 and 25 of cam-portions and with the series 26 of cam-portions.

In the particular illustrated device the several series of presser devices are so positioned that series 36, 38 and 40 are operated by the series 24 and 26 of cam-portions, and series 37, 39 and 41 are operated by the series 25 and 26 of cam-portions. Thus in each complete rotation of the cam-head each series 36-41 of presser-devices will be operated twice.

The illustrated arrangement of each series of cam portions is such that in the rotation of the cam head 23 in clockwise direction in Figs. 7-11, these cam portions will successively operate the several series of presser-devices to cause them to close the tubes 48-53, which they respectively oppose, at points immediately opposite these presser-devices, in succession, the arrangement being such that at no time are all of the presser-devices in a position in which the tubes 48-53, opposing them, are open, it being understood that these tubes, by reason of their resiliency expand as the respective presser-devices become freed from the cam portions to move away from the tubes.

Referring now to the specific operation of the

several series of presser-devices, as each series operates in the same manner and in accordance with the same pre-arranged sequence of action, a description of the operation of one series only, namely, series 36, will suffice.

Assuming that the cam head 23 is in the position shown in Figs. 3 and 7-11, inclusive, wherein the presser-device 78, by engaging the cam portion 63, and the presser-device 82, by engaging the unnotched part of the cam-head 23, are in such positions that the tube 48 is caused to be closed at these points (Fig. 3) and the presser-devices 79, 80 and 81 are out of engagement with all of the cam portions of the head, the rotation of the head in clockwise direction carries the cam portion (notch) 67 into registration with the presser-device 82 to permit the tube 48 to open at this point while maintained closed at the presser-device 78, the cam portions 64, 65 and 66 and the unnotched portion of the cam-head circumferentially aligned with the presser-head 82 thereupon being successively carried into engagement with the presser-devices 79, 80, 81 and 82, respectively, to press the latter in succession from the left to the right in Fig. 3 against the tube 48 and force the fluid therein to and through the nozzle of the device, the presser-device 78 remaining in tube-closing position until the presser-device 82 has closed the tube at this point, and the presser-devices 78, 79, 80 and 81 becoming retracted in succession following their movement to tube-collapsing position. Following the ejection of the fluid, by the presser-devices as stated, the presser-device 82 remains in tube-closing position while the others of the presser-devices are in retracted position as shown of the presser-devices 93-97 in Fig. 3 and thereafter the presser-device 78 is forced to tube-closing position and the cycle of operations above described is repeated.

It is desirable that in the opening of the tube 48 at the presser-device 82, which occurs after the tube is closed by the presser-device 78, but is in expanded condition between the presser-devices 78 and 82 as shown in Fig. 3, creation of suction in the tube forwardly beyond the presser-device 82, with resultant back flow of pumped fluid toward the presser-device 82, be prevented, or controlled, and this I accomplish by providing for the forcing outwardly of one of the intermediate presser-devices 79, 80 and 81 substantially simultaneously with the retraction of presser-device 82, as for example, and preferably the presser-device 79 as shown in Fig. 3a, this being effected by appropriately shaping the cam portion 64 relative to the cam portions 63 and 67.

It will be understood from the foregoing that the successive operations of the presser-devices as stated serve to produce a pulsating action on the fluids in the tube thereby to cause it to be intermittently projected through the nozzle of the device where the coating fluid is supplied to the compressor-devices through the tube 48 by pressure produced by gravity flow, or otherwise, the operation of the presser-devices serving to control the discharge of the fluid through the pipe 48 and causing fluid to discharge from the pipe intermittently, the fluid spurting from the nozzle intermittently and thereby causing the fluid to issue in separated bodies of relatively large size, depending upon the dimensions of the various parts, as compared with the size of the bodies resulting from the subjection of such fluid to an atomizing action.

Where the supply of coating fluid is not supplied to the presser-devices under pressure, as for

example where it is located in a tank disposed below the presser-devices and does not flow thereto under pressure, the device operates to cause the fluid to flow to the device and forces the fluid out through the nozzle as stated. In the case of the use of the device with a supply of coating fluid under conditions requiring the drawing of the fluid to the presser-devices, as stated, the result above explained is due to the operation of the presser-devices in succession and in the timed relation as stated, due to the fact that in the operation of these presser-devices they are operated in succession from a position in which the tube is closed, to a position in which the tube is open, from the left hand toward the right hand end of the series in Fig. 3 thereby forcing the fluid along the tube to the right in this figure and in such operation producing, by the expanding of the tube to normal condition, after being contracted, the reduction in fluid pressure at this point which causes the fluid to flow to the right in the tube.

As will be understood, the intermittent, pulsating, discharge from the several pipes 40-53, according to the illustrated embodiment of my invention, is through a single nozzle (though as to certain features of my invention it is not limited to such single discharge) which presents advantages over plural discharge, one of which is that a desirable degree of blending of colors on the foundation surface may be effected without requiring that such surface be wetted and without requiring great skill on the part of the operator.

Furthermore, by constructing a device in accordance with my invention an infinite number of cam and presser combinations can be made and a vast range of different combinations of color effects may be produced; this being made possible not only because of the ability to supply fluids of any selected colors or tones through the pipes 40-53, but also because of the adaptability of the device, by reason of the capability of the sets of presser-devices for cooperation with either or both sets 24 and 25 of cam portions, as desired, to produce any desired sequence of fluid-discharge from the tubes, it being possible to effect simultaneous discharge from selected ones of the tubes or discharge at different times during each revolution of the cam head.

Under some conditions of use it may be desirable to vary the volume of discharge from the several tubes 40-53 relative to each other, and this I have provided for by forming each spider-arm 54 with an adjustable backing section 110 shown as hinged at 110a to the arm 54 to extend into a slot 111 in the arm and present a backing surface for substantially such part of the tube opposing it as extends opposite the intermediate presser-devices (as shown in Fig. 3). The outermost position occupied by the backing section 110 is controlled by a nut 112 bearing against the section 113 and screwing on the outer end of a stud 113 provided on the arm 54 and extending through a slot in the outer end of the section 110. Thus by the adjusting of the section 110 away from the side of the tube from its position shown in Fig. 3, the amount of fluid discharged to the nozzle will be reduced, due to the elasticity of the tube, the amount of reduction in flow depending upon the particular set position occupied by the section 110.

While I have illustrated and described a particular embodiment of my invention I do not wish to be understood as limiting it thereto, as the same may be variously modified and altered

without departing from the spirit of my invention. Thus, by way of example, the presser-devices of certain sets thereof, as desired, may be unprovided with the notches 108 and thus these
 5 presser devices would be operated by all three sets of cam-portions; the cam set 26 may be the same as cam set 24 in which case the presser-devices registering with cam set 25 would operate
 10 once each revolution, the presser-devices registering with cam sets 24 and 26 would operate twice each revolution and, assuming certain of the sets of presser-devices to be unnotched at 108, such set or sets would operate three times
 15 each revolution; and the positions of the cam portions of the sets thereof angularly about the head may be varied as desired; thus instead of the cam portions of the sets being equally spaced apart in a direction around the head they may be unequally spaced as for example certain thereof
 20 at 180° and the other at 90° thereto. Furthermore, variations in the quantity of material delivered by each tube may be effected otherwise than by providing the adjustable sections 110 as for example by using tubes of different sizes.

25 What I claim as new, and desire to secure by Letters Patent, is:

1. In a device of the character set forth, the combination of a plurality of flexible tubes, and means for producing intermittent projection of
 30 fluids through said tubes comprising a rotary member having cam portions and around which said tubes are grouped in a circumferential series and presser-devices interposed between said member and tubes and actuated by said cam portions.

2. In a device of the character set forth, the combination of a plurality of flexible tubes, and means for producing intermittent projection of
 40 fluids through said tubes comprising a rotary member of tapering form and having cam portions and about which said tubes are grouped, said tubes converging in the direction of the taper of said member and a series of presser-devices interposed between said member and
 45 tubes and actuated by said cam portions.

3. In a device of the character set forth, the combination of a plurality of flexible tubes, and means for producing intermittent projection of
 50 fluids through said tubes comprising a rotary member having cam portions and around which said tubes are grouped in a circumferential series and presser-devices interposed between said member and tubes and actuated by said cam portions, said device having converging passages in
 55 communication with said tubes and a single outlet opening to said passages.

4. In a device of the character set forth, the combination of a plurality of flexible tubes, and means for producing intermittent projection of
 60 fluids through said tubes comprising a series of presser-devices adapted to operate against said tubes and means for actuating said presser-devices comprising series of spaced apart cam portions movable relative to said presser-devices in
 65 different planes, said series of presser-devices being so shaped that when in one position they will be engaged, and operated, by one series of said cam portions and when set into another position
 70 will be engaged, and operated, by the other of said series of cam portions.

5. In a device of the character set forth, the combination of a plurality of flexible tubes, and means for producing intermittent projection of
 5 fluids through said tubes comprising a series of presser-devices adapted to operate against said tubes and means for actuating said presser-devices comprising series of cam portions movable relative to said presser-devices, the cam portions
 10 of a plurality of said series being spaced apart and movable in different planes and the cam portions of another of said series being movable in the planes of said plurality of series, said series of presser-devices being so shaped that when
 15 in one position they will be engaged, and operated, by one of said plurality of series and by said last mentioned series and when set into another position will be engaged, and operated, by the other of said plurality of series and by
 20 said last mentioned series.

6. In a device of the character set forth, the combination of a flexible tube for the fluid and means for producing intermittent projection of
 20 fluid through said tube comprising a series of presser-devices extending lengthwise of said tube and in a position to be forced against a side of the tube, and means adapted to engage said presser-devices and force them in succession
 25 against the tube and operating in such sequence that in one portion of the cycle of operation of said presser-devices non-adjacent ones thereof will be in tube-closing position and as the presser-device adjacent the outlet of the tube starts
 30 to retract one of the intermediate presser-devices starts on its tube-closing movement for preventing retrograde movement of the pumped fluid.

7. In a device of the character set forth, the combination of a plurality of flexible tubes, the device having a single-discharge outlet in communication with said tubes, and means for producing intermittent projection of fluids through
 40 said tubes comprising a series of presser-devices extending lengthwise of each tube and in a position to be pressed against the tube and means adapted to engage said series of presser-devices and force them in succession against the tube
 45 and operating in such sequence that in one portion of the cycle of operation of each of said presser-devices non-adjacent ones of said presser-devices will be in tube-closing position and as the presser-device adjacent the outlet of the tube
 50 starts to retract one of the intermediate presser-devices starts on its tube-closing movement for preventing retrograde movement of the pumped fluid.

8. In a device of the character set forth, the combination of a drive shaft, a member surrounding said shaft and having recesses extending
 55 lengthwise of said shaft and presenting inclined outer surfaces converging in the direction of the outer end of said shaft, said member having radial slots at said inclined surfaces, a tapered head on said shaft and having cam portions, series of presser-devices in said slots and positioned to be operated by said cam portions, flexible tubes overlying said presser-devices, and
 60 a spider connected with said member and having arms overlying said tubes and forming backings therefor, said spider having a single discharge opening in communication with said tubes.

MAJOR E. GATES.