

March 24, 1959

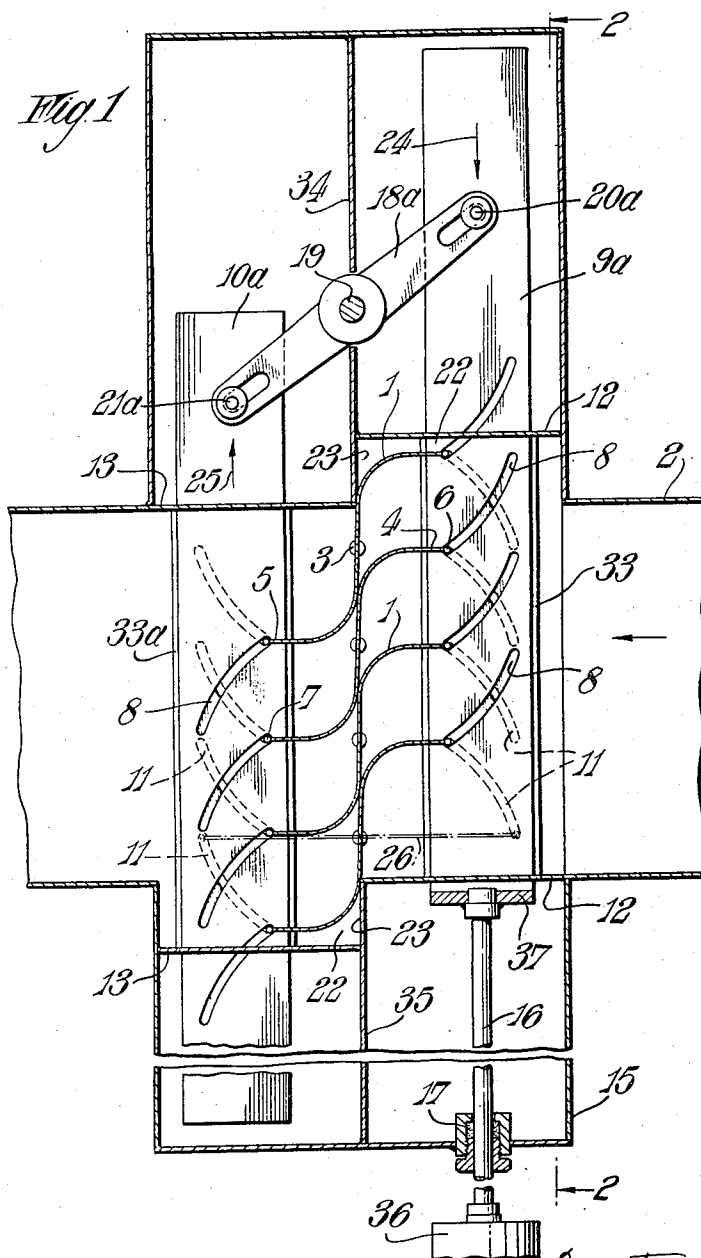
R. C. FARNHAM ET AL

2,878,831

FLUID CONTROL MEANS

Filed Feb. 4, 1957

4 Sheets-Sheet 1



Inventors:
 Rex Courvelles Farnham
 Edward Francis Daniel Webb by
 Morgan Finnegan Durham & Poirer
 Attorneys.

March 24, 1959

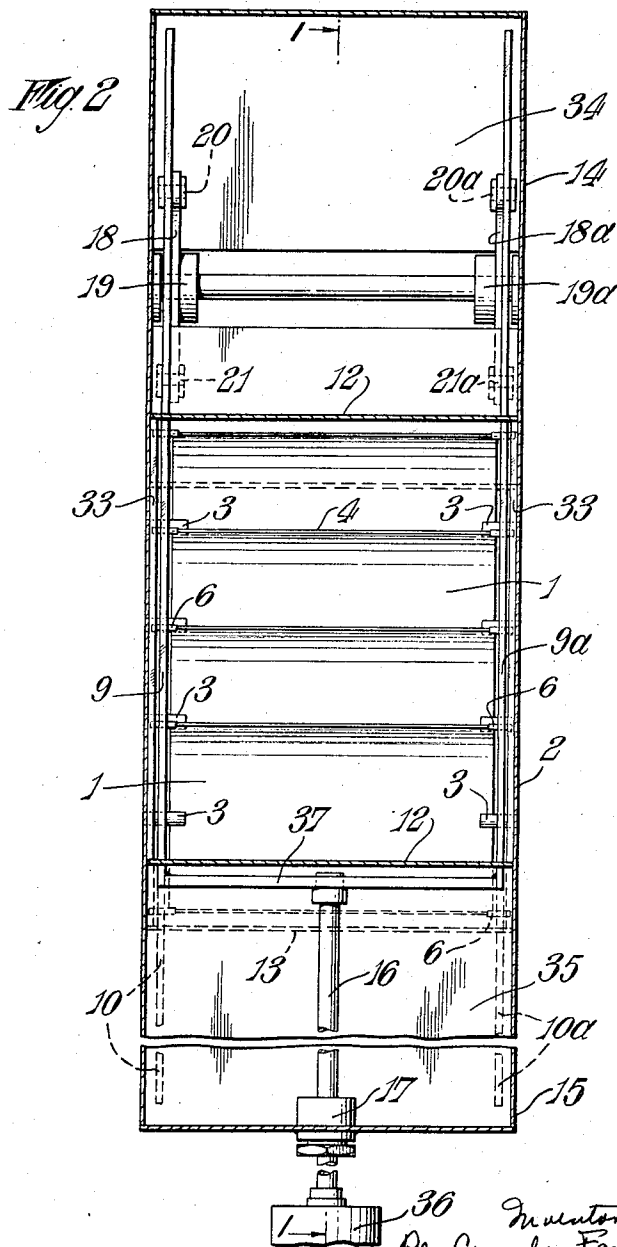
R. C. FARNHAM ET AL

2,878,831

FLUID CONTROL MEANS

Filed Feb. 4, 1957

4 Sheets-Sheet 2



Inventors:
 Rex Cornelius Farnham
 and
 Edward Francis Daniel Wulff by
 Morgan Finnegan Simcik & Price
 Attorneys.

March 24, 1959

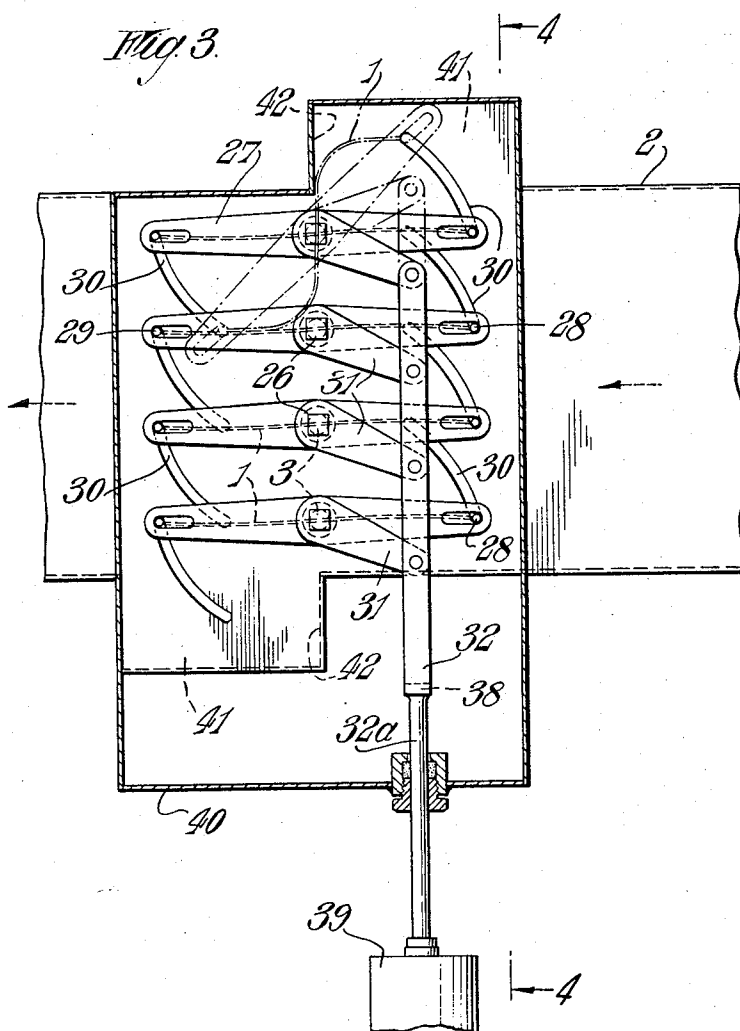
R. C. FARNHAM ET AL

2,878,831

FLUID CONTROL MEANS

Filed Feb. 4, 1957

4 Sheets-Sheet 3



Inventors
 Rex Connelas Farnham and
 Edward Francis Daniel Webbly
 Morgan, Finnegan, Dunham & Price
 Attorneys

March 24, 1959

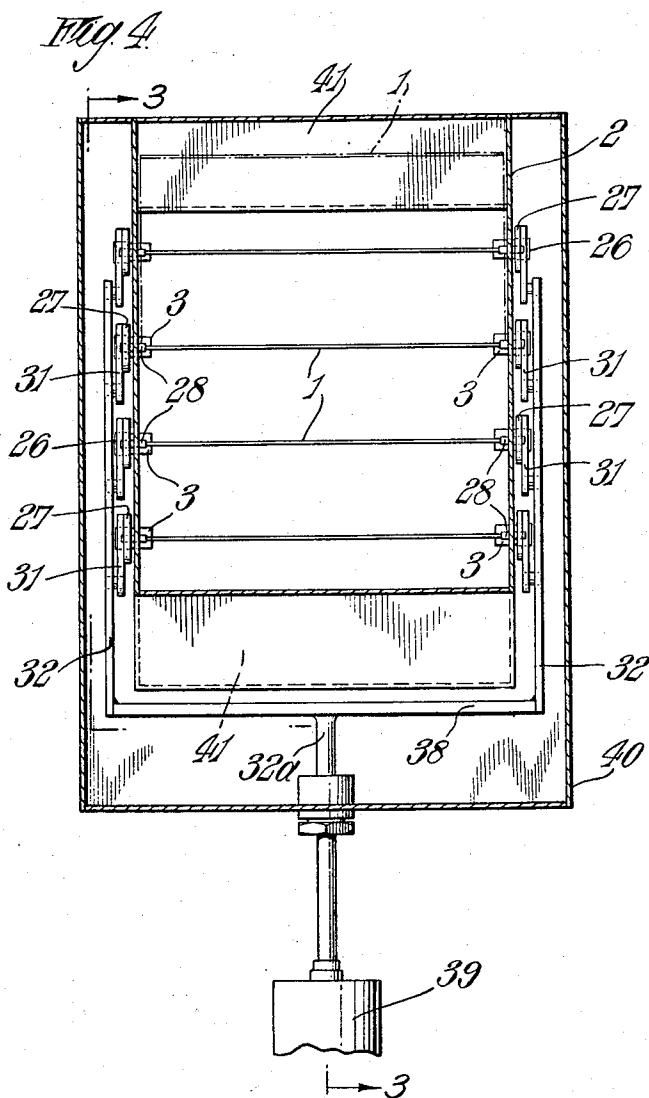
R. C. FARNHAM ET AL

2,878,831

FLUID CONTROL MEANS

Filed Feb. 4, 1957

4 Sheets-Sheet 4



Inventors:
R. C. Farnham and
Edward Francis Daniel Webb, Jr.
Morgan Firmogen Dinsmore & Price
Attorneys

1

2,878,831

FLUID CONTROL MEANS

Rex Couvelas Farnham, Woodley, Reading, and Edward Francis Daniel Webb, Wokingham, England

Application February 4, 1957, Serial No. 637,978

6 Claims. (Cl. 137—601)

The invention relates to fluid control means.

It is well-known that the characteristics of conventional dampers involving a closing element pivotally mounted in a duct, when used for controlling the rate of fluid through a duct, are unsatisfactory, insofar as the control of the flow is governed principally by the creation of turbulence around the leading and trailing edges of the pivoted damper element. Further, such means of control exert little influence over the fluid flow between the positions in which the damper element is fully opened and the position in which it is nearly half closed, the influence of the control means increasing rapidly towards the position at which complete closure of the duct is effected. The use of such means, furthermore, involves large power losses.

It is among the objects of the invention to control the flow of fluid through a duct more effectively and without creating violent turbulence, resulting in power losses.

According to the invention, means are mounted in the fluid duct which are effective to control the flow by guiding it smoothly and gradually, in the use of flexible elements which can be bent to exert the required degree of control, without projecting into the duct an obstruction which leads to the creation of turbulence.

According to the invention, the fluid control means comprise a series of spaced parallel flexible plates or blades, pivotally mounted at an intermediate position of the plates or blades, in the fluid duct which is advantageously of rectangular section, in such manner as to lie in the fully open position axially with the line of fluid flow in any desired plane, and means operable externally of the duct for rotating the plates or blades on their pivots and to force the leading and trailing edges of the plates or blades to follow a guided curved path, so as to present in the fully closed position, in which the outermost of the plates or blades at top and bottom engage an abutment or shoulder formed in the wall of the duct, an S-shape in section, whereby the gap between the plates or blades is progressively opened or closed respectively to increase or reduce without shock and without the creation of turbulence, the rate of flow between the plates or blades.

According to the invention furthermore, the leading and trailing edges of the plates or blades may be stiffened or strengthened and the plates or blades linked together so as to be operable together.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, which illustrate the control means as applied to a duct of rectangular section.

Figure 1 is a section on the line 1—1 of Figure 2 showing the control means according to the invention, with the plates or blades in the fully closed position;

Figure 2 is a cross-section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 4 showing a modified construction of the control means

2

according to the invention, with the plates or blades in the fully open position; and

Figure 4 is a cross-section on the line 4—4 of Figure 3.

In carrying the invention into effect according to Figures 1 and 2 of the drawings, the control means comprise a series of flexible plates or blades 1 mounted horizontally in spaced relation in a fluid duct 2 of rectangular section. The plates or blades 1 which are rectangular in plan extend the full width of the fluid duct 2 and are pivotally connected at a position intermediate of their length by means of pivots 3, to the side walls of the fluid duct 2.

The actuating members 9, 9a and 10, 10a are mounted so that their ends extend through slots formed in guide plates 12 and 13, which form part of the duct 2, into housings 14 and 15 provided above and below the fluid duct 2. The housings 14 and 15, which are provided with baffle plates 34 and 35 respectively, serve to enclose the actuating members and to prevent the escape of fluid from the duct.

A manually or hydraulically operated control rod 16, mounted in a cylinder 36, is provided to extend through a sealing gland 17 formed in the housing 15 and to be secured to the lower ends of the actuating members 9, 9a, through a cross-member 37, to move the members 9, 9a, in a vertical direction during operation. This vertical movement is transmitted to the actuating members 10, 10a by means of links 18, 18a which are pivotally mounted at their centres 19, 19a in the housing 14 and pivotally secured at 20, 20a and 21, 21a respectively to the upper ends of the actuating members 9, 9a and 10, 10a.

In the fully closed position, the plates or blades 1 are bent into an S-shape in section so that they assume the position shown in Figure 1 of the drawings. For this purpose the fluid duct 2 is formed with channels 22 to present abutments 23 against which the uppermost plate and the lowermost plate, engage.

To open the duct to allow passage of the fluid, the control rod 16 and thus the members 9, 9a are moved downwardly in the direction of the arrow 24, thereby causing the links 18, 18a to pivot about their centres, and to move the members 10, 10a upwardly in the direction of the arrow 25. This movement causes the pins 6 and 7 to slide in the guide slots 8 and 11 so that, in the fully open position, the plates or blades 1 are straightened and assume a position parallel to the direction of flow of the fluid as shown in the chain dot line 26 of Figure 1.

In the modified construction shown in Figures 3 and 4 the plates or blades 1 are mounted in parallel spaced relation in the fluid duct 2, of rectangular section, by means of pivots 3. The pivots 3 extend through the sides of the duct 2 and are provided with square ends 26 on which are mounted guide arms 27.

The guide arms 27 are pivotally mounted on pins 28 and 29, which are provided respectively on the leading and trailing edges of the plates or blades 1, and which extend through guide slots 30 formed in the sides of the fluid duct 2.

Operating links 31 are mounted, at one end, on the square ends 26 of the pivots 3 and at the other end are pivotally connected to operating members 32 which are connected through a cross-member 38, to a manually or hydraulically operated control rod 32a mounted in a cylinder 39. The guide arms 27, the operating links 31 and the control rod 32 may be enclosed in leak-proof boxes or housings 40 to prevent the escape of fluid from the duct 2.

Movement of the control rod 32 in the vertical direction causes the pins 28 and 29 to slide in the guide slots 30 and thus bend the plates or blades 2 to open or close the fluid duct in the same manner as described with

3

reference to the construction illustrated in Figures 1 and 2 of the drawings.

The duct 2 is formed with channels 41 to present abutments 42 against which, in the fully closed position, the uppermost and lowermost plate engage.

Thus it will be understood that at any position between the fully open and fully closed positions of the plates or blades, the plates or blades present an evenly curved surface and thus permit an even or streamlike flow of the fluid through the duct without causing turbulence of the fluid.

The invention is not limited to the particular means described for operating the plates or blades, thus any suitable means may be used provided only that they serve to apply a smooth curvature to the blades in the manner hereinbefore described.

We claim:

1. Means for controlling the flow of a fluid through a duct, comprising a series of flexible elements extending transversely of said duct so as to open and close off the duct to the flow of fluid therethrough, said elements being mounted in parallel spaced relation with each other in said duct in such manner as to lie, in the fully open position axially with the direction of flow of said fluid so as to leave gaps between said elements for the flow of said fluid, pivot means mounted at an intermediate position of said elements, means for constraining the leading and trailing edges of said elements, to follow a guided path, and means for varying the curvature of said elements so as to present S-shape sections which overlap in the fully closed position whereby said gaps between said elements are progressively increased or decreased respectively to increase or decrease, without the creation of turbulence, the rate of flow of said fluid through said duct.

2. Means according to claim 1, in which the duct is formed on opposite sides with outwardly projecting chan-

4

nels to present on each side an abutment or shoulder, to receive, in the fully closed position, the outermost elements.

3. Means according to claim 1, in which the means for varying the curvature of the elements comprises at least two actuating blades slidably mounted to extend through the duct, and a control rod mounted externally of the duct.

4. Means according to claim 1, in which the means for varying the curvature of the elements comprises at least two actuating blades provided with guide slots to receive pins mounted to project from the leading and trailing ends of the elements, and a control rod mounted externally of the duct.

5. Means according to claim 1, in which the means for varying the curvature of the elements comprises at least two actuating blades provided with guide slots to receive pins mounted to project from the leading and trailing ends of the elements, a series of blind guide slots provided on opposite inner faces of the of the duct to receive the ends of the pins projecting from the elements, and a control rod mounted externally of the duct.

6. Means according to claim 1, in which the means for varying the curvature of the elements comprises a series of guide arms mounted at their centres, externally of the duct, on the pivots of the elements, a series of guide slots formed in opposite sides of the duct to receive pins which project outwardly from the leading and trailing ends of the elements, the ends of the pins being pivotally connected to the ends of the guide arms, a series of links mounted at one end on the guide arms and at the other end pivotally connected to operating members, and a control rod mounted externally of the duct.

No references cited.