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(54) Compact silencer for a condensation boiler

(57) For a wall-mounted gas-fired condensation boiler (1), a silencer (9) for introducing air into a mixer member (6) which receives the gas and is connected to a fan (5) which feeds this gas and said air to a conduit (4) connected to a burner (3), said silencer (9) presenting a body (12) having a first aperture (21) for drawing air from the external environment and a second aperture (50) to which the mixer member (6) is connected for its air intake; at least two parallel conduits (31, 40, 44) are provided within said body (12) and are separated by a dividing wall or baffle (24) provided with at least one internal aperture (36) to enable communication between said conduits (31, 40, 44), said baffle (24) creating two parallel combustion air flows and guiding these to the mixer member (6).

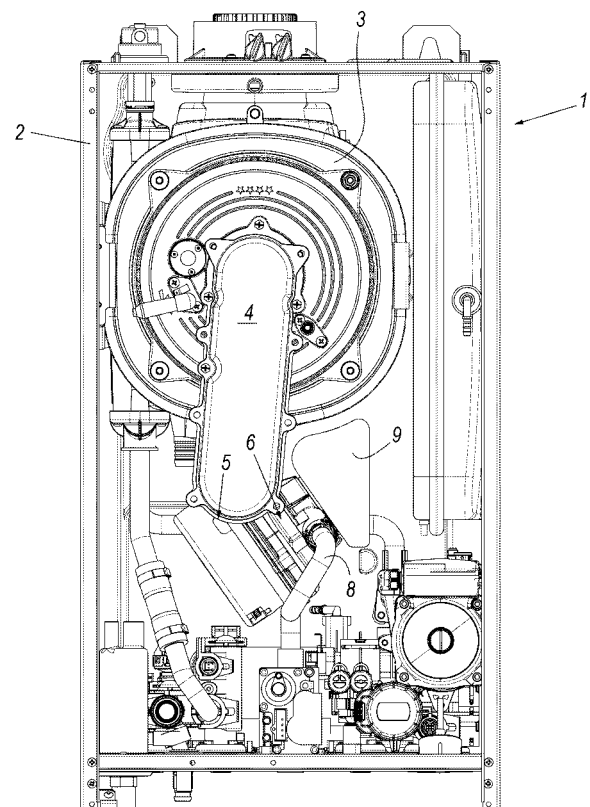


Fig. 1

Description

[0001] The present invention relates to a silencer for a wall-mounted gas-fired condensation boiler in accordance with the introduction to the main claim.

[0002] A boiler of the stated type is known to comprise a burner which receives a mixture of gas and air through a conduit connected to a fan. This latter is operationally associated with a mixer member receiving the gas and the combustion air.

[0003] In recent years condensation boilers have become increasingly more important because of their high efficiency. In this respect, there is a known tendency to reduce wastage of currently available energy sources by paying maximum attention to their utilization and seeking to achieve maximum efficiency in their use. This tendency also applies to natural gas.

[0004] To achieve optimal utilization of this gas, it is known to construct buildings which are better insulated thermally than in the past and which use high-performance condensation boilers, which however have a much lower thermal power than previously (from 3 to 5 kW during heating). However this power reduction opposes the need for the availability of ever more hot water in living accommodation, often due to the presence of two or more bathrooms.

[0005] The result is that boiler manufacturers are faced with two apparently opposing requirements, i.e. to provide boilers of very low thermal power during heating but of high thermal power during hot water production. These requirements result in the construction of boilers with a high modulation range: currently a condensation boiler has a modulation range from 8 kW to 24 kW or from 10 to 28 kW, whereas the objective is to guarantee a variation from 2 kW to 24 kW or from 3 kW to 28 kW.

[0006] The use of condensation boilers is becoming increasingly more important. However, improving efficiency in small-dimension boilers intended for domestic heating by increasing the boiler power density results in "sound" problems linked to the generation of low frequency vibration or high frequency hissing. These problems derive from fluctuations in the pressure of the fuel/air mixture within the burner and variations in the flow of combustion air or of the air/fuel mixture through the conduits and members connected to the burner or combustion chamber.

[0007] Because of these problems, it is known to use silencers where the combustion air enters towards the mixer member. However, known silencers present various complex geometries which are bulky and negatively affect the overall boiler dimensions, which cannot be reduced to enable it to occupy a dedicated space within a kitchen or compartment provided to contain it.

[0008] An object of the present invention is to provide a silencer which is highly efficient but of reduced dimensions compared with known silencers, to enable it to be used within boilers of small dimensions (for example 700 mm height x 390 mm width x 290 mm depth).

[0009] Another object is to provide a silencer of the stated type which is of simple construction and easy to mount within a condensation boiler.

[0010] These and other objects which will be apparent to the expert of the art are attained by a silencer in accordance with the accompanying claims.

[0011] The present invention will be more apparent from the accompanying drawings, which are provided by way of non-limiting example and in which:

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Figure 1 is a front view of a condensation boiler with its front wall removed for clarity, but provided with a silencer according to the invention;

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Figure 2 is a perspective view of the silencer of Figure 1 associated with a functional part of the boiler;

Figure 3 is an exploded view of that shown in Figure 2;

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Figure 4 is a transparent view of the silencer of Figure 1; and

Figure 5 is an exploded view of the silencer of Figure 4.

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[0012] With reference to said figures, Figure 1 shows a condensation boiler 1 comprising an outer casing 2 containing a burner 3 which receives a mixture of air and gas via a mixing conduit 4. This is connected to a fan 5 itself connected to a mixer member 6 of known type, connected to a gas conduit 7. The mixer member 6 is connected to a silencer 9 to which atmospheric air flows.

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[0013] According to the invention, the silencer 9 comprises a box body 12 having perimetral side walls 16 and 17, an upper wall 18, a lower wall 19 and an end wall 20 (all with reference to Figures 1, 4 and 5) provided with an aperture 21. The body 12 is not provided with the second end side wall but with an opening 23 thereat. Through this, a baffle 24 is inserted (to form a perfect seal), defined by a first wall which is straight (or in any event such as to be able to be disposed longitudinally within a longitudinal cavity 30 of the body 12 bounded by the walls 16, 17, 18, 19 and 20) and is arranged slightly inclined to a central plane P through said body 12 perpendicular to the lower wall 19 so as to define within the body 12 a first conduit 31 (connected to the aperture 21) in combination with the upper wall 18, side wall 16 and end wall 20 thereof, against which the wall 25 rests.

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[0014] The baffle 24 is associated with a wall 32 to be positioned against the end opening 23 of the body 12, to close it. In proximity to this wall 32, the baffle 24 presents an aperture or recess 36 bounded by said wall 32 and by a web 37 associated with the baffle 24 and directed, when the baffle is inserted into the body 12, towards the lower wall 19 and the side wall 17 thereof, against which it rests. This web is connected to a second wall 39 separating from the first wall 25 of the baffle 24 and directed towards and resting on the said side wall 17 of the body 12 to define in combination with this latter wall, with the upper wall 18 and with the web 37, a second conduit 40 through which the air moves in the opposite direction to

that through the conduit 31. This second wall 39 is inclined to the first wall.

[0015] The wall 39 has a length less than the baffle and has its free end 39A spaced from that side wall 20 of the body 12 which faces it.

[0016] In this manner, within the conduit 40 an aperture 42 is obtained directed towards another (third) conduit 44 lying below the wall 39 and bounded at one end by the web 37 and by the walls 17 and 19 of the body 12. The web 37 rests on the perimetral wall 16 and, as already stated, on the lower wall 19 to close the conduit 44 at a through hole 50 provided in the wall 16.

[0017] In this manner, the silencer 9 comprises an aperture 21 for its air entry, and substantially parallel conduits 31, 40 and 44 through which the air entering the box body 12 passes (arrows K, W and X respectively) until it reaches the hole 50 through which the air leaves the silencer (arrow Y). This hole 50 is connected to the mixer member 6 so that the air which has passed through the silencer can reach this member and the fan 5 connected to it. Any resonance, hissing, etc. is damped within the silencer, with the result that the boiler is silent in use.

[0018] Because of the particular formation of the silencer 9, i.e. of the body 12 containing a plurality of substantially parallel conduits for air passage, a relatively lengthy path is achieved for the air, but within an environment (the body 12) of small dimensions: by way of example, the body 12 can have a depth (distance between the wall 20 and the wall 32) between 180 and 270 mm, preferably between 210 and 230 mm, such as to enable it to be used in a boiler of less than 300 mm in depth.

[0019] The baffle 24 of the silencer 9 also performs the function of guiding the air flows within the body 12 (intake and delivery to the fan), so reducing pressure drops.

[0020] A preferred embodiment of the invention has been described. Others are however possible (such as that in which the silencer 9 presents a baffle 24 defining only two parallel conduits within its body 12, with the apertures 21, 50 being provided in the same wall of the body) and are to be considered as falling within the scope of the following claims.

Claims

1. For a wall-mounted gas-fired condensation boiler (1), a silencer for introducing air into a mixer member (6) which receives the gas and is connected to a fan (5) which feeds this gas and said air to a conduit (4) connected to a burner (3), said silencer (9) presenting a body (12) having a first aperture (21) for drawing air from the external environment and a second aperture (50) to which the mixer member (6) is connected for its air intake; **characterised in that** at least two parallel conduits (31, 40, 44) are provided within said body (12) and are separated by a dividing wall or baffle (24) provided with at least one internal

aperture (36) to enable communication between said conduits (31, 40, 44), said baffle (24) creating two parallel combustion air flows and guiding these to the mixer member (6).

2. A silencer as claimed in claim 1, **characterised in that** the baffle (24) is separate from the silencer body (12) and is arranged to be inserted securely into a cavity (30) defined within the body (12) by its side walls (16, 17), upper wall (18) lower wall (19) and end wall (20), another end of this body having an opening (23) to enable the baffle (24) to be inserted into the body (12), the baffle comprising an end wall (32) which becomes positioned against the opening (23) when the baffle is inserted into said body (12), to hence close it.
3. A silencer as claimed in claim 2, **characterised in that** its first aperture (21) is provided in the end wall (20) of its body (12), the other aperture (50) being provided in a different wall (17) of said body (12).
4. A silencer as claimed in claim 2, **characterised in that** said first and second aperture (21, 50) are provided in the same wall of said body (12).
5. A silencer as claimed in claim 1, **characterised by** comprising three parallel conduits (31, 40, 44) provided in the silencer body (12) and bounded by the baffle (24) and by the walls (16, 17, 18, 19, 20) of said body (12).
6. A silencer as claimed in claim 5, **characterised in that** said baffle (24) comprises a first straight wall (25) to lie longitudinally within the silencer body (12), a web (37) deviating from said first wall (25) and a second wall (39) inclined to said first wall and fixed to it.
7. A silencer as claimed in claim 1, **characterised in that** said first wall (25) is advantageously inclined to a central plane (P) through said silencer body (12) and rests against the upper wall (18), against at least one side wall (16) and against the end wall (20) of said body, to hence define the conduits (31, 40, 44) within the silencer (9).
8. A silencer as claimed in claim 6, **characterised in that** the web (37) rests against the lower wall (19) of the silencer body (12) and against a side wall (17) of this latter, this web, in combination with the first wall (25) and second wall (39) of the baffle (24) and the upper wall (18) of said body (12), defining within the silencer the second conduit (40), which is parallel to the first (31) and through which the air moves in the opposite direction to that in which it moves through the first conduit (31), these conduits being connected together by an aperture (36) in the baffle

(24).

9. A silencer as claimed in claim 8, **characterised in that** the second wall (39) of the baffle (24) rests against a side wall (17) of the silencer body (12) and has a free end (39A) spaced from that end wall (20) of said body (12) which faces it, to hence define an aperture (42) which connects the second conduit (40) to a third silencer conduit (44) defined by the second wall (39) and by a side wall (17) of the silencer body (12), and bounded by the web (37) of the baffle (24), said third conduit being connected to the second aperture (50) of the silencer (1), the air passing through this third conduit in the same direction as its passage through the first conduit.
10. A silencer as claimed in claim 1, **characterised by** having a depth, measured longitudinally, of between 180 and 270 mm and preferably between 210 and 230 mm.

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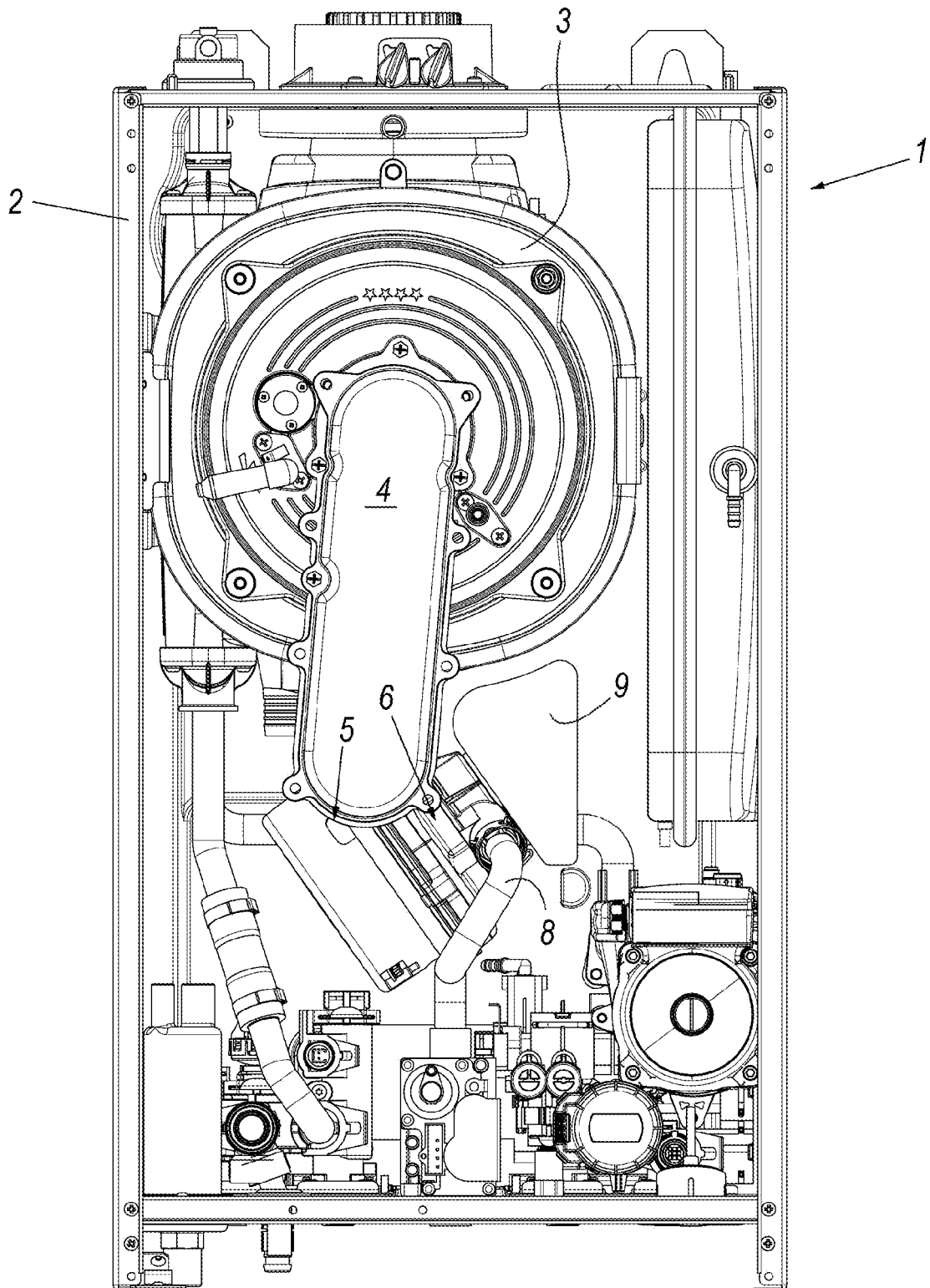


Fig. 1

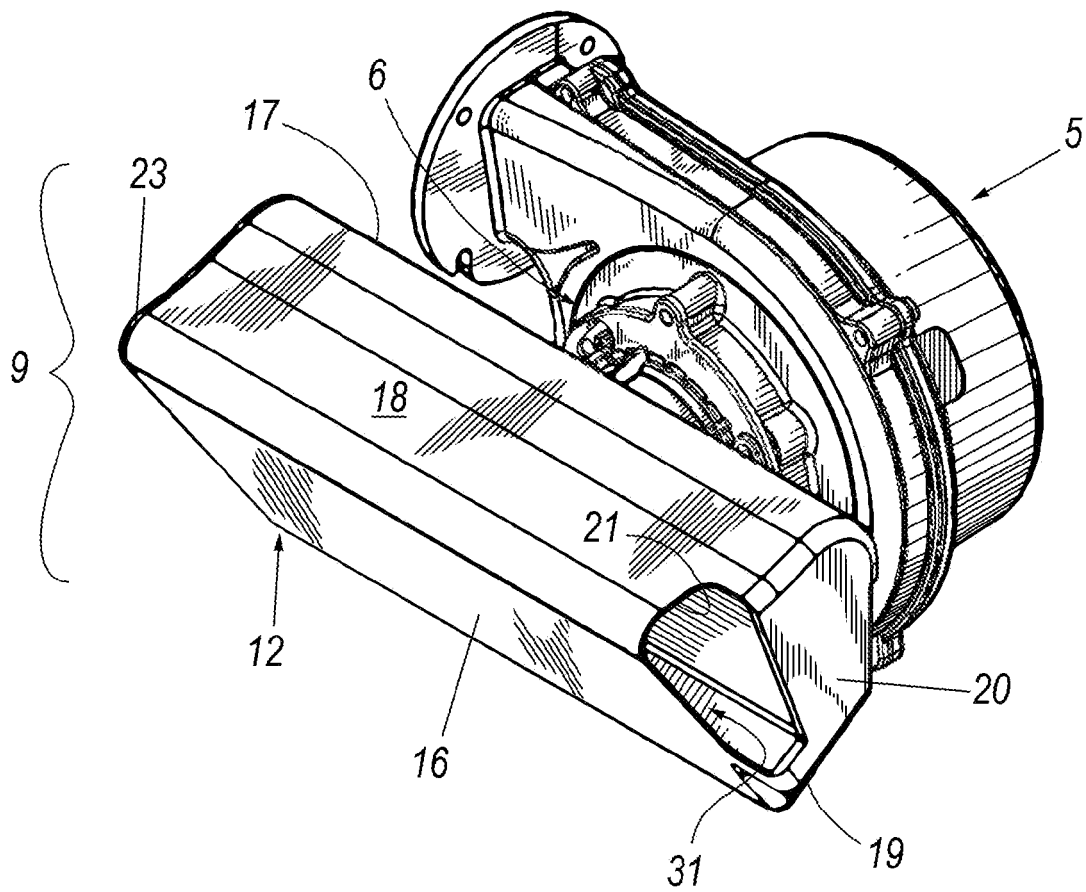


Fig. 2

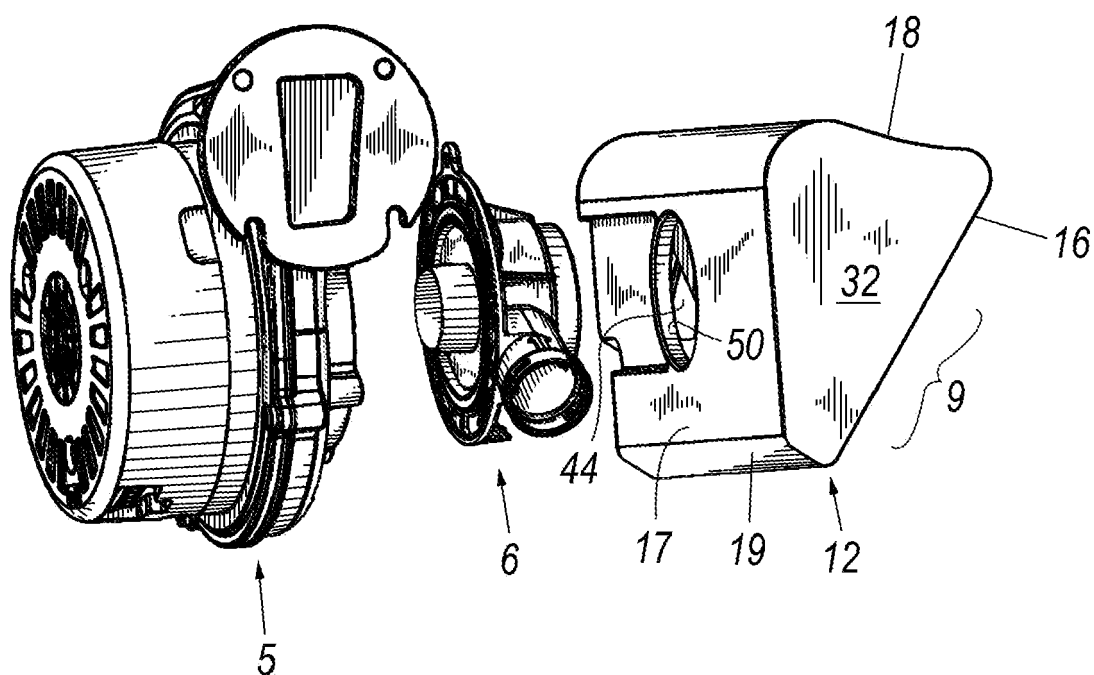


Fig. 3

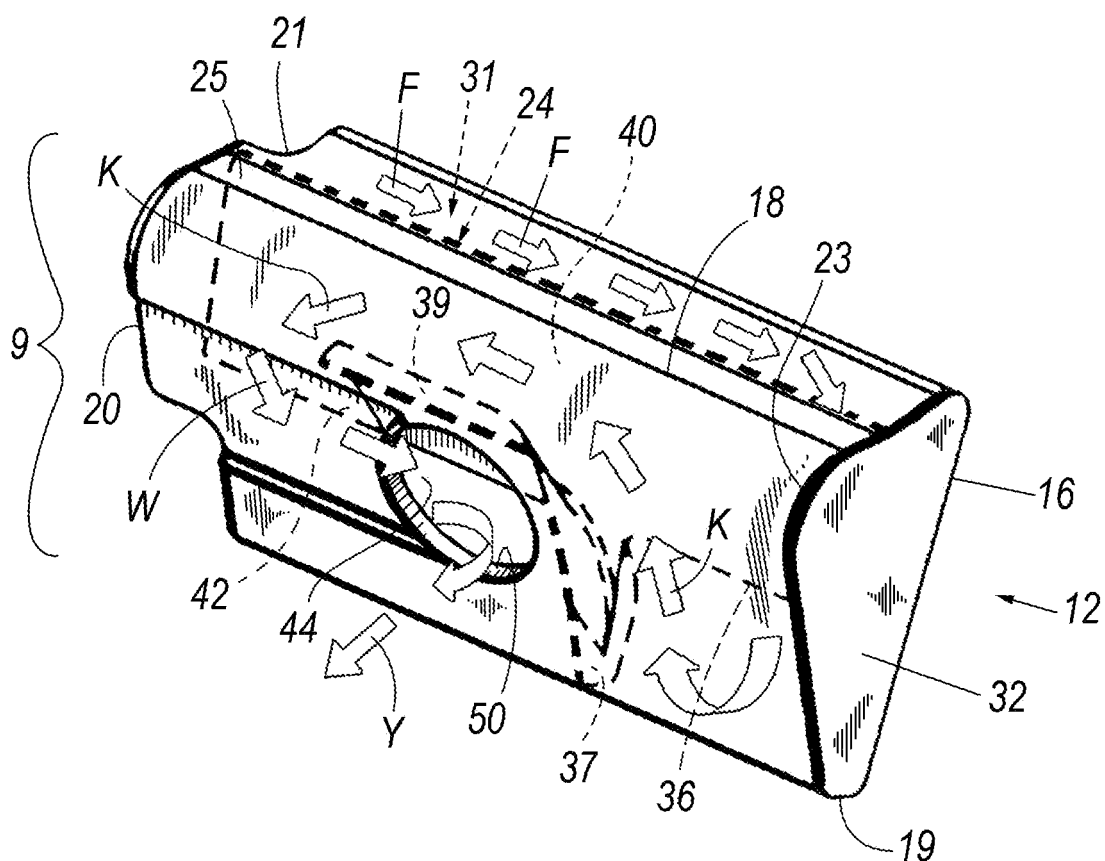


Fig. 4

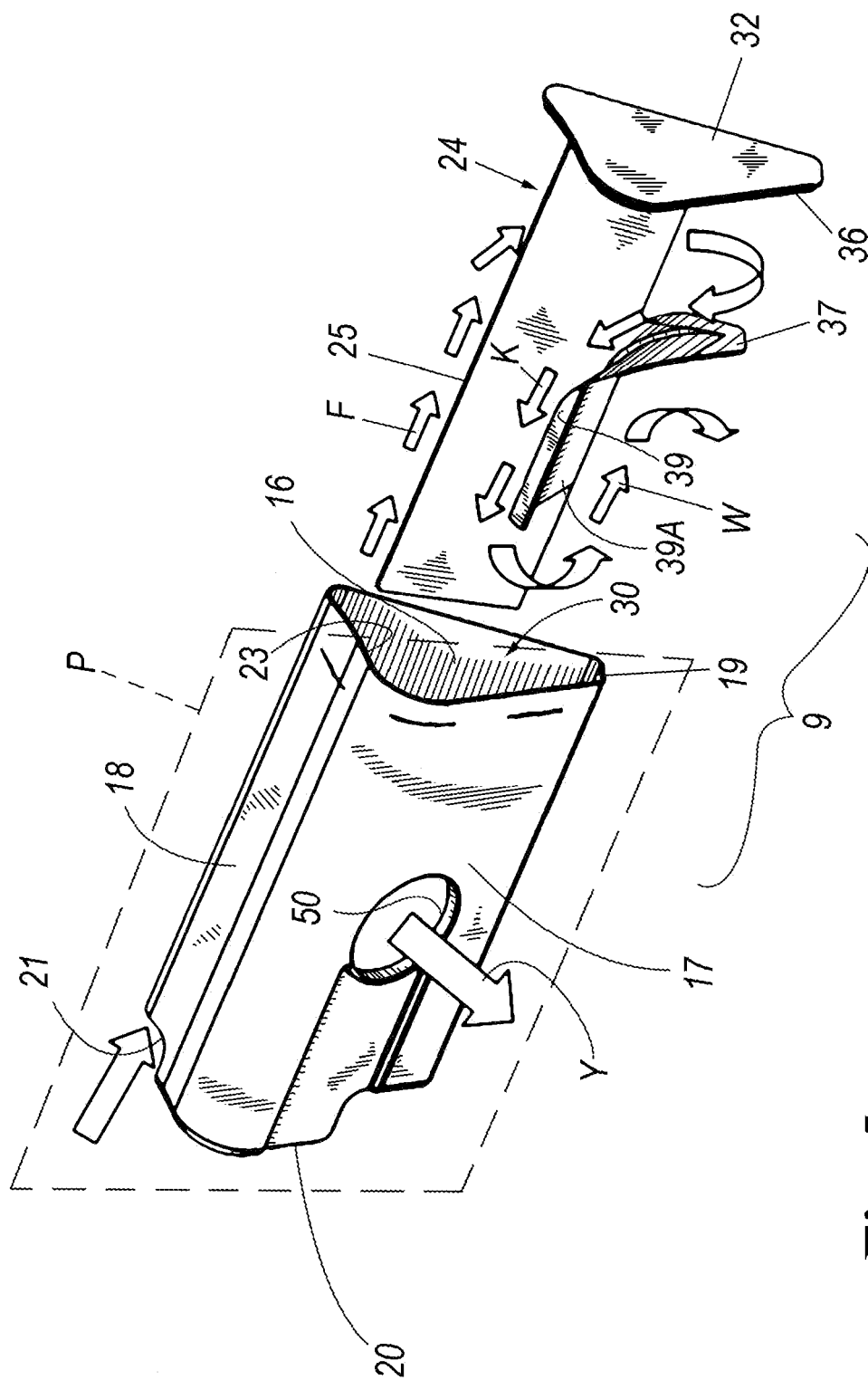


Fig. 5