United States Patent

DuBois

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[45] **Apr. 11, 1972**

[54] ACOUSTIC CONDUIT WITH WRINKLE SECTION

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[52] **U.S. Cl.**.....**181/36 B,** 181/33 D, 181/48, 181/69

[51] **Int. Cl.**.....**F01n 1/02,** F01n 1/08

[58] **Field of Search**.....181/36, 36.2, 42, 50, 48, 59, 181/71, 72, 61–63, 57, 35.2, 47, 68–70, 49

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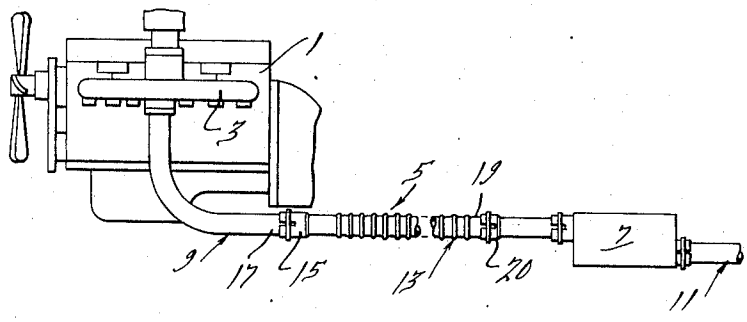
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[57] **ABSTRACT**

A conduit having an outwardly extending wrinkled wall of approximately a 4 foot length is used in a motor vehicle exhaust system to provide acoustic control and attenuation, the pipe section preferably being located to include an anti-node point of an objectionable frequency and ahead of the muffler.

3 Claims, 4 Drawing Figures



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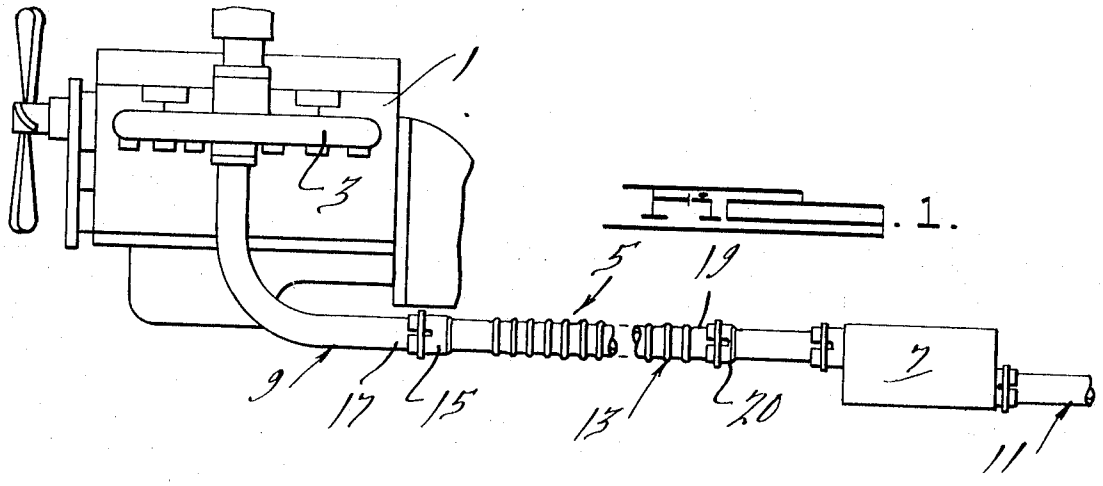


FIG. 1.

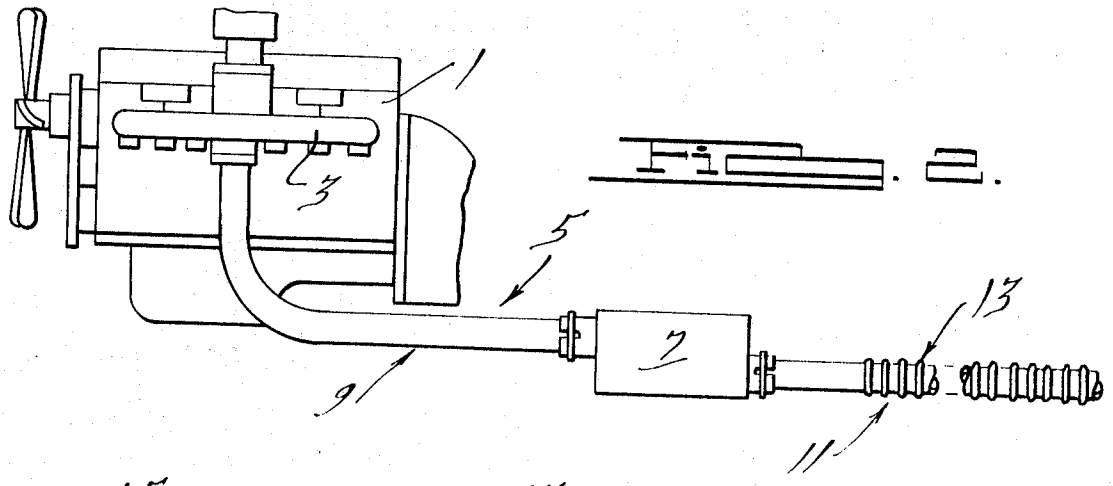


FIG. 2.

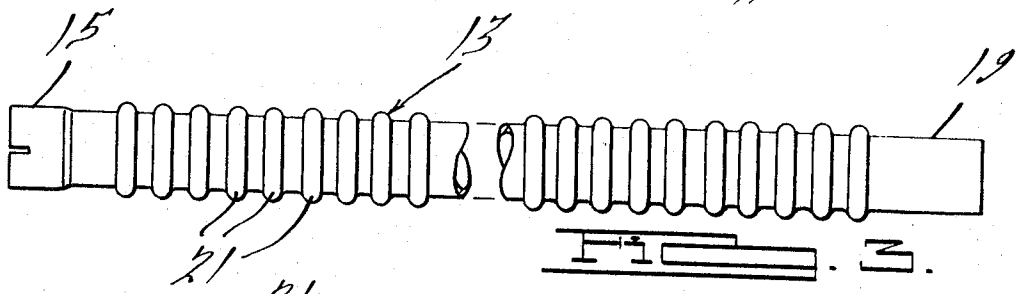


FIG. 3.

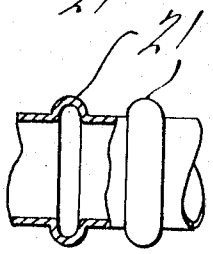


FIG. 4.

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ACOUSTIC CONDUIT WITH WRINKLE SECTION

BRIEF SUMMARY OF THE INVENTION

It is the purpose of this invention to modify the normal exhaust pipe or tailpipe sections of a motor vehicle exhaust system so that these sections can be used to improve the quality of sound in the system and even reduce the sound intensity to some degree. The invention accomplishes this by making a substantial length of the exhaust pipe or tailpipe of a wrinkled configuration which has the effect of changing the frequency mix and giving better tonal quality and when placed in an anti-node or pressure point position causing some reduction in the sound level of the particular note or frequency.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of an internal combustion engine exhaust system embodying the invention;

FIG. 2 is a view similar to FIG. 1 but showing a modified form;

FIG. 3 is a detailed view of the wrinkle pipe section; and

FIG. 4 is an enlarged view of a section of the pipe of FIG. 3.

DESCRIPTION OF THE INVENTION

Referring to FIG. 1, the engine 1 has an exhaust manifold 3 which discharges gases into an exhaust system 5 that includes a silencing muffler 7 which is connected by an exhaust pipe 9 to the manifold at its inlet end and by a tailpipe 11 to atmosphere at its outlet end. In accordance with the invention, the exhaust pipe 9 includes a wrinkle pipe section 13 that is preferably about 4 feet long and preferably located so that approximately its midpoint is located adjacent an anti-node or high pressure point of an objectionable sound frequency in the exhaust system 5. As seen best in FIG. 3, the wrinkle pipe section 13 has an inlet end 15 which receives and is clamped to an upstream section 17 of the exhaust pipe and an outlet section 19 which is received within and clamped to a downstream exhaust pipe section 20.

The wrinkle pipe 13 comprises a uniform nominal diameter pipe which has a series of outwardly extending embossments 21 that are preferably shaped similarly to the structure shown in section in FIG. 4. The embossments are preferably located adjacent each other, even more closely than indicated in the drawings, and apparently create a beneficial turbulence in the gas flow. The length of the section 13 is preferably no greater than four feet since tests have indicated that a longer length increases backpressure in the system to an undesirable degree.

When the section 13 is located in an anti-node position there is a beneficial effect on the note producing the anti-node. For example, in one system where the wrinkle pipe was placed in the 100 Hz–109.5 Hz. anti-node positions the fundamental low note peak at 1,000–1,300 RPM was reduced approximately 6 decibels throughout this range and the peak shifted down to 750–800 RPM. There was also a reduction in the first odd harmonic of approximately 5 decibels through the 1,600–2,000 RPM decibel range with the peak being shifted down to 1,250–1,350 RPM, the same frequencies being affected in both cases. The wrinkle pipe produced a smoother sounding system with better tonal quality and with less blow torch type roughness and idle beat. There was no significant increase in backpressure.

In the arrangement of FIG. 2, the wrinkle pipe section 13 is reversed end for end and placed in the tailpipe 11 instead of in the exhaust pipe 9. Substantial improvements of the type indicated for the system of FIG. 1 are achieved, particularly if the section is located so that an anti-node falls at a central portion of it.

Even when not located in an anti-node position the wrinkle pipe improves the frequency mix giving better tonal qualities and makes the exhaust sound more pleasing even though the total sound may not be substantially decreased. The wrinkle section 13 therefor enables the exhaust pipe or tailpipe section to become a part of the acoustic control and attenuation means of the exhaust system. The results are somewhat better if the wrinkle section is used in the exhaust pipe rather than the tailpipe. It is noted that the wrinkle section 13 can be bent to suit the requirements of a particular application.

I claim:

1. In an exhaust system for an internal combustion engine having a muffler and gas passage conduits leading to and from the muffler, said system including an objectionable sound frequency, an acoustic control and attenuation element comprising a wrinkle pipe section in one of said conduits with a substantially uniform nominal diameter wall having a multiplicity of outwardly extending annular embossments in the wall spaced closely together along the length of the section, the anti-node of said objectionable sound frequency being located centrally of said wrinkle section.

2. A system as set forth in claim 1 wherein said wrinkle section is no more than about 4 feet in length.

3. A system as set forth in claim 1 wherein said wrinkle section is located in the conduit that connects the engine to the muffler.

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