Jan. 17, 1950 J. KUTTNER 2,494,947

ENGINE MANIFOLD CONSTRUCTION

Filed Nov. 16, 1946 2 Sheets-Sheet 1

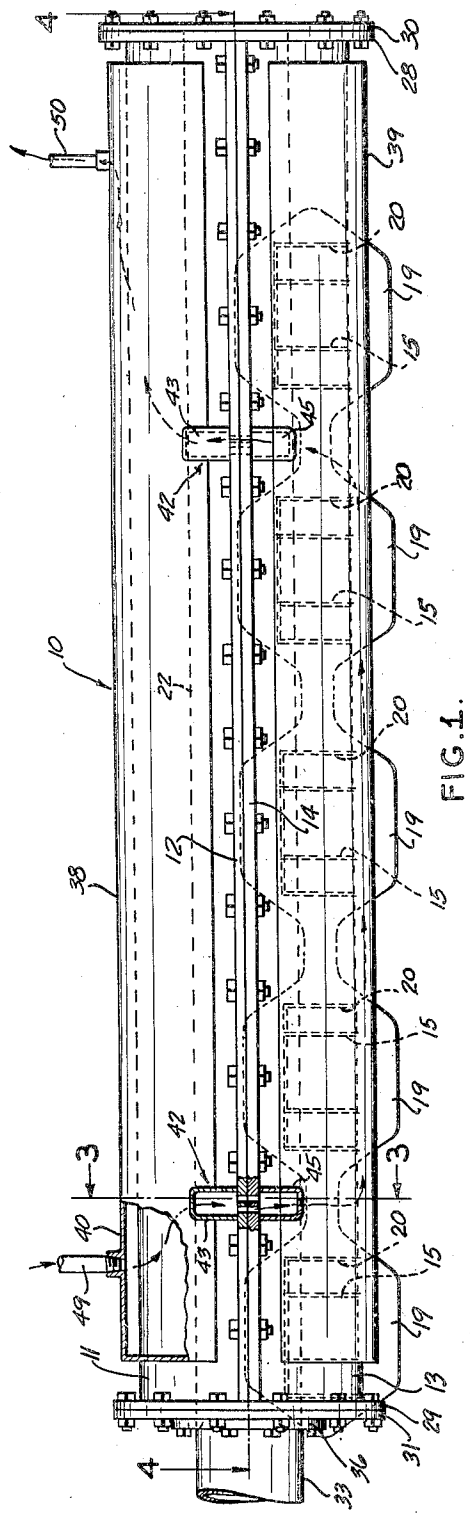


FIG. 1.

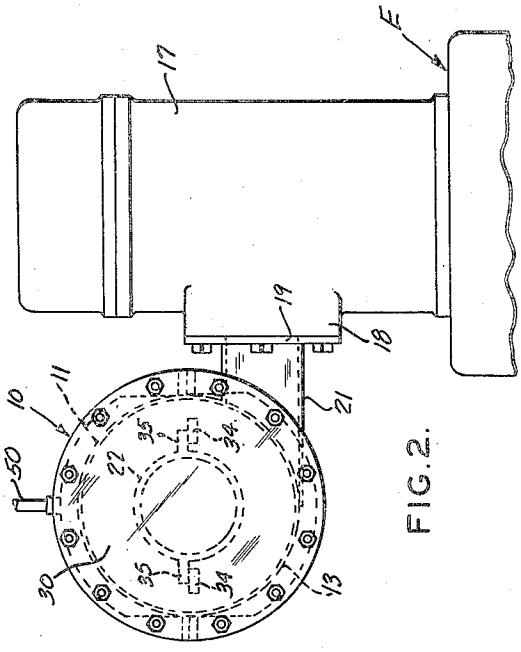


FIG. 2.

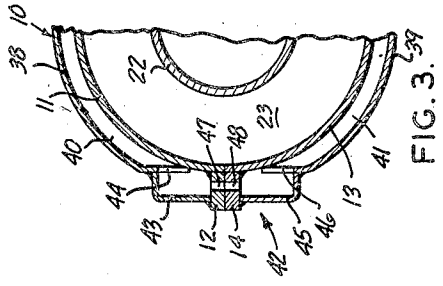


FIG. 3.

INVENTOR
JULIUS KUTTNER
By Paul L. Kahn
ATTORNEY

Jan. 17, 1950 J. KUTTNER 2,494,947

ENGINE MANIFOLD CONSTRUCTION

Filed Nov. 16, 1946 2 Sheets-Sheet 2

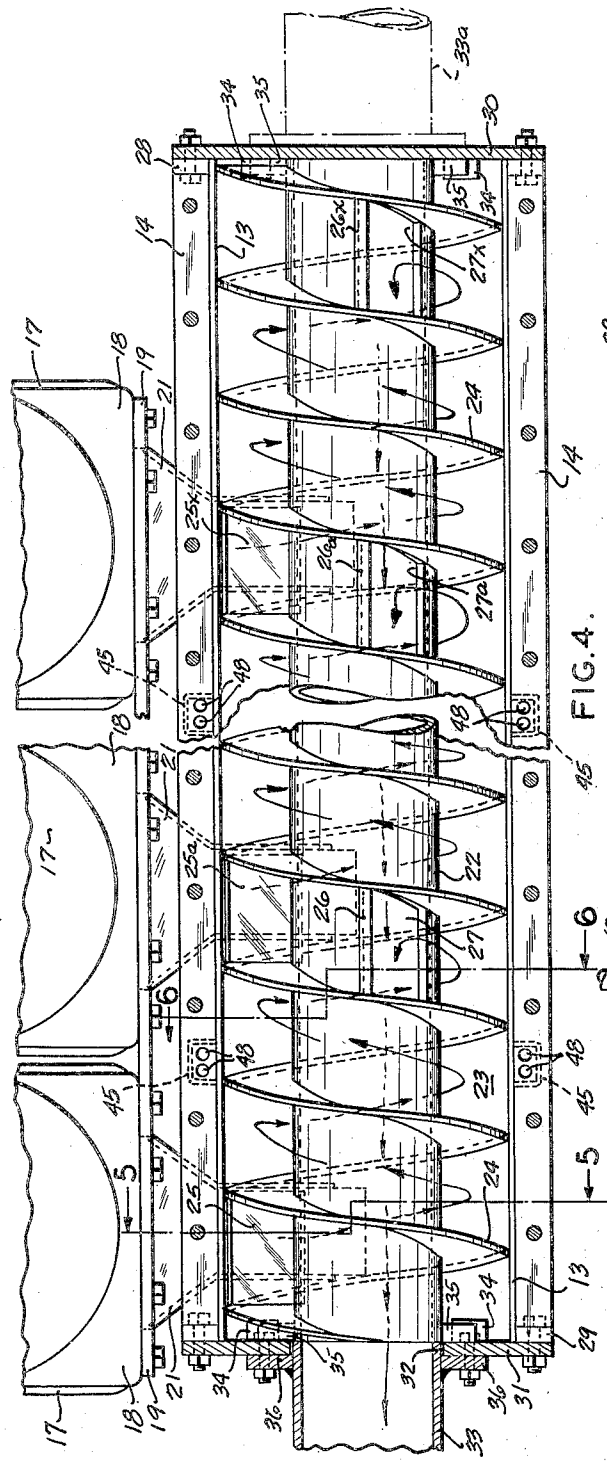


FIG. 4.

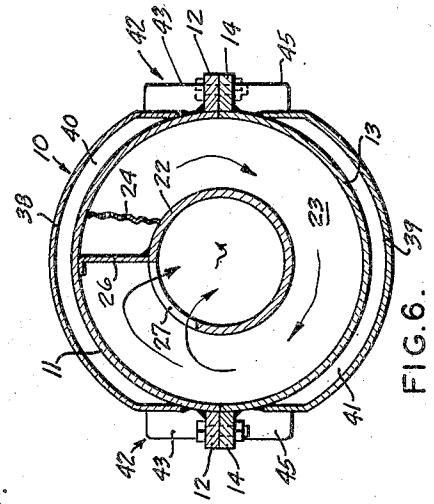


FIG. 6.

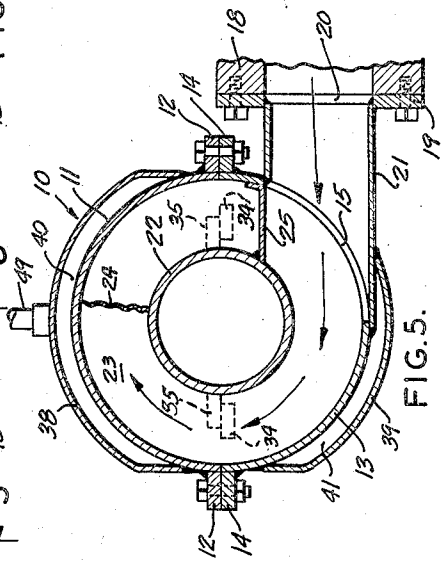


FIG. 5.

INVENTOR
JULIUS KUTTNER
By Paul L. Kosher
ATTORNEY

Patented Jan. 17, 1950 2,494,947

UNITED STATES PATENT OFFICE

2,494,947

ENGINE MANIFOLD CONSTRUCTION

Julius Kuttner, Beloit, Wis., assignor to Fairbanks, Morse & Co., Chicago, Ill., a corporation of Illinois

Application November 16, 1946, Serial No. 710,263

2 Claims. (Cl. 60—29)

1

This invention relates to fluid flow manifolds, and more especially to exhaust gas manifolds for internal combustion engines.

It is known that the most satisfactory exhaust gas flow condition for an internal combustion engine is attained by an arrangement of individual exhaust gas ducts for each cylinder. However, practical manifolding installations dictate that the several individual ducts be combined so as to reduce the bulk and space needs of a large number of exhaust ducts. A further practical consideration to be accorded manifold installations is the need of a noise suppressor or muffler. Where individual ducts are provided a separate muffler is required for each duct, but a manifold common to all cylinders of the engine requires only one muffler and, as a result, the bulk of the installation is thereby minimized.

Accordingly, an important object of the invention is to be found in the provision of an improved manifold having the advantages of distinct individual exhaust gas ducts combined in a practical manifold assembly which requires a minimum of space for its installation and but a single noise suppressor or muffler.

It is also an object of this invention to provide an improved manifold for a multi-cylinder engine, in which the manifold is arranged to define initially separate and distinct flow passages for each cylinder, and in which the several passages lead to a common flow passage opening from the manifold, the arrangement being such that the initially separate flow passages have a general axial trend coincident with the axis of the common flow passage thereby resulting in a compact manifold.

Another object resides in the improved arrangement of concentrically related and elongate hollow members providing an annular space therebetween for the reception of a single helically formed baffle or insert member which, in combination with the concentric members, defines a continuous passage; and in the further arrangement of baffle means positioned to interrupt the helically defined passage and provide separate and distinct passages each extending from an opening in one hollow member to an opening in the other hollow member.

Another object resides in the improved arrangement of means defining separate passages of helical conformation opening to a common central passage concentrically related therewith and in position to provide the axis of revolution for the helical passages thereby resulting in a simple, easily formed and assembled manifold

2

possessing the desirable features of compactness with individuality of passageways to the extent found best suited to the needs and characteristics of the engine with which the manifold is associated.

Other objects reside in the form, construction and arrangement and combination of means which will fully carry out the above stated objects to best advantage.

A preferred embodiment of the present invention is disclosed in the accompanying drawing, in which:

Fig. 1 is a longitudinal side elevational view of the improved manifold in which certain details are indicated in broken section;

Fig. 2 is an end elevational view of the manifold, together with a schematic showing of an engine cylinder connected thereto;

Fig. 3 is a fragmentary transverse sectional view through the manifold as taken along line 3—3 of Fig. 1;

Fig. 4 is a top plan view in longitudinal section showing important features of the manifold in association with the engine cylinders, the view being taken along line 4—4 of Fig. 1;

Fig. 5 is a transverse sectional elevational view of the manifold as seen along line 5—5 of Fig. 4; and

Fig. 6 is a further transverse sectional elevational view at line 6—6 of Fig. 4.

Referring now to the drawing, the present manifold assembly 10 is formed of an upper casing section 11 having longitudinally extending and radially projecting flanges 12 welded thereto at the opposite diametrical margins, a lower casing section 13 also having flanges 14 similarly formed and attached as in the case of the upper section 11. The lower casing section, in the present embodiment, is formed with a plurality of openings or ports 15 spaced along the length thereof as shown in Figs. 1 and 4. In transverse section the location of one such port 15 is clearly shown in Fig. 5. The number of such ports is, of course, dependent upon the number of engine cylinders, and in Fig. 1, the manifold 10 is constructed for use with a five-cylinder engine.

With particular reference to Figs. 1, 2, 4 and 5, the present manifold 10 is positioned relative to engine E to extend longitudinally and at one side of the cylinders 17. The respective cylinders 17 are provided with an exhaust gas collector box 18 to which a closure plate 19 is suitably secured, each plate having a port 20 (Fig. 5) and an exhaust tube 21 extending therefrom for

welded connection with a corresponding port 15 of the manifold. Each tube 21 is shown in Fig. 4 to have a convergent section in plan, and in Fig. 5 to have a uniform section in elevation. Any other configuration may be employed, however, to meet the conditions of engine-manifold assembly. It is particularly important to observe that each exhaust tube 21 joins with its respective manifold port 15 for directing the exhaust gas flow in a tangential direction relative to the axis of the manifold casing sections 11 and 13.

The manifold assembly further includes an interior exhaust gas collecting conduit which is exemplified by the tubular number 22 (Figs. 4 and 5) concentrically disposed within the casing sections 11 and 13 and extending the length thereof. Thus the casing sections and the member 22 coact to define an annular chamber 23 into which the exhaust gas flow from each cylinder tube 21 is tangentially directed. As the exhaust gas stream enters the annular space or chamber 23 from each tube 21 at port 15, it not only follows a tangential path therein but is simultaneously directed along a helical path by means of the baffle member 24 (Fig. 4) which extends continuously along the length of the manifold chamber 23 and is helically formed to define a flow path between the flights of the baffle for exhaust gas, as indicated by the arrows.

Beginning with the left hand cylinder 17 in Fig. 4, it will be noted that an initial flow directing baffle plate 25 is secured between the adjacent flights of the helical baffle member 24 to provide an interior continuation of the engine exhaust tube 21 for confining the flow of exhaust gas tangentially inwardly and below the collector conduit 22. Following the arrows, the exhaust gas flow follows the helical path around the conduit 22 and between the baffle flights for approximately two and one half revolutions or until it reaches a cut-off baffle plate 26, at which zone the collector conduit 22 is provided with a port 27 (Fig. 6) for admitting the exhaust gas stream interiorly thereof. At approximately a one quarter revolution beyond the cut-off baffle plate 26, a second flow directing baffle plate 25*a* is secured between the flights of the helical member 24 for directing the exhaust gas stream from the next cylinder 17 into a distinctly separate path which is substantially similar to that for the first cylinder. The second stream also makes two and one half revolutions about the member 22 and is directed through a port 27*a* by cut-off baffle plate 26*a* into the common conduit member 22 where it joins the first stream for eventual exhaust as is indicated by the arrows.

This arrangement of directing baffles 25 and cut-off baffles 26 within the helical passage formed by the member 24 together with the exhaust ports 27 in conduit 22 is repeated for each cylinder of the engine E, and accordingly the last such arrangement of baffles and ports may be identified by the reference characters 25X, 26X and 27X respectively. Thus, each cylinder of the engine E is provided with a distinctly separate exhaust gas flow passage within the manifold assembly, and each such stream follows a helical course which may have any desired length but which is desirably compacted within a single manifold of the character disclosed. The present embodiment shows that each such helical course makes two and one half revolutions of the conduit 22 before reaching the common collecting passage within the same. A longer or shorter flow path may be provided by repositioning the cut-off baffles, by increasing the pitch of the helical baffle flights, or by any combination of either variable factor.

Turning now to the details of construction of the present manifold, it will be observed in Figs. 1 and 4, that the casing sections 11 and 13 are closed at one end (the right hand end in Fig. 4) by a removable cover 30 secured to flanges 28 on each section, and that the opposite end carries a cover 31 secured to flanges 29 and having a central aperture 32 to receive a tail pipe 33 leading away from the manifold to a muffler (not shown) or to a point of exhaust. Each cover carries a pair of lugs 34 located in diametrically spaced relation and at one side of the true diameter thereof (see Figs. 5 and 6). When the conduit 22 is positioned within the casing sections 11 and 13, a pair of diametrically spaced lugs 35 welded thereto and located to one side of the true diameter abut the lugs 34 and prevent relative turning movement therebetween. Prior to positionment of the conduit 22 within the casing sections 11 and 13, the helical baffle member 24, with its several baffle plates 25 and 26 are secured in assembly on the conduit. The manifold assembly may then be completed by the attachment of the individual exhaust tubes 21 and plates 19 to afford a unitary structure adapted for ready securement to the engine exhaust gas boxes 18. The tail pipe 33, having a flange 36, may then be mounted on cover plate 31 as shown in Fig. 4.

An alternate arrangement of the tailpipe assembly is indicated in Fig. 4 wherein the covers 31 and 30 may be interchanged to provide for reverse exhaust gas discharge from tailpipe 33*a*, shown in phantom. The varying engine installation provisions may at times require the location of the tailpipe at one end and at other times at the opposite end. Hence, the removable and interchangeable character of covers 30 and 31 will facilitate and make this variation feasible.

A further feature of the present manifold includes the provision of fluid cooling means in the nature of jacket sections 38 and 39 secured to the casing sections 11 and 13 respectively (Fig. 1). It may not be necessary, in all cases, to have manifold cooling, but where such cooling is desired or necessary the present jacket will provide adequate cooling thereof. The respective jackets 38 and 39 are formed and secured to the respective casing sections 11 and 13 as indicated in Figs. 3, 5 and 6 to define fluid flow chambers 40 and 41 which are placed in communication at a plurality of zones by transfer box means 42 (Figs. 1, 3, 4 and 6). Each transfer box 42 includes an upper section 43 open to the chamber 40 through a suitable port 44 formed in the upper jacket side wall, and a lower section 45 open to the lower jacket chamber 41 by means of port 46. Registering apertures 47 and 48 in the flanges 12 and 14 of the casing sections 11 and 13 respectively serve to conduct the cooling fluid between the transfer box sections 43 and 45. As may be seen in Fig. 1 an inlet tube 49 for cooling fluid and an outlet tube 50 therefor are provided for connection with the upper jacket 38 near opposite ends thereof. The cooling fluid flow into the lower jacket is by gravity through certain of the transfer boxes 42 and by pressure lift to the outlet 50 through others of such boxes 42.

Having now fully described a preferred, but not the only embodiment of the invention, it will be appreciated that the engine exhaust gas from each cylinder is initially treated as though a separate exhaust pipe were provided, and that a desired degree of exhaust conduit length is

obtained. Thus a nearly ideal arrangement is achieved without materially increasing the space requirements therefore by the improved arrangement of concentric members having a plurality of helically defined and distinctly separate flow paths, extending from inlet to outlet. The resulting compactness of manifold and the further provision of an exhaust gas tailpipe of interchangeability, end for end results in an engine installation arrangement having great flexibility as to space required and location. The present manifold has been described as for exhaust gas flow from an internal combustion engine, but it will be appreciated that it may have other uses and that the direction of fluid flow through the separate helical paths may be reversed if desired for adaption of the manifold to such other uses.

Certain variants and modifications may come to mind in view of the foregoing disclosure, and it is the aim to include such variants and modifications within the scope of the appended claims.

What is claimed is:

1. A manifold comprising a tubular conduit having a plurality of longitudinally spaced ports formed therein, a casing surrounding said conduit, means for closing the ends of said casing to provide a closed chamber between said conduit and casing, said casing having a plurality of longitudinally spaced ports formed therein, a continuous baffle member of helical conformation disposed in the chamber to provide a helical passageway extending the length thereof, the pitch of said helical baffle being selected such that said ports open between adjacent flights thereof, a first set of baffle elements positioned one adjacent each of said casing ports, and a second set of baffle elements positioned one adjacent each of said conduit ports, said baffle member and sets of baffle elements serving, with the walls of said casing and conduit, to define distinctly separate passageway sections of a predetermined length between adjacent casing ports, each being closed intermediate its ends, but extending between a port in said casing and a port in said conduit and each being of substantially equal length.

2. A manifold structure comprising a conduit open at its ends, of uniform cross-section throughout its length and providing longitudinally spaced ports; a casing providing longitudinally spaced ports and surrounding said conduit in spaced relation to form an elongate annular chamber therewith; a continuous and helically formed baffle member disposed in the annular chamber to define a helical passageway along the length of the manifold, the pitch of the helix and the spacing of said conduit and casing ports being such as to locate each of said ports between adjacent flights of the baffle member; a first set of baffle elements extending between adjacent flights of the baffle member and each such element being located adjacent a casing port; a second set of baffle elements extending between adjacent flights of the baffle member and each such element being located adjacent a conduit port, said baffle member and sets of baffle elements cooperating to define distinctly separate helical passages of a predetermined length between adjacent casing ports, and each passage being closed intermediate its ends but extending from a casing port as an inlet to a conduit port as an outlet; means closing one end of the annular chamber between said casing and conduit; and other means closing the opposite end of the annular chamber and the adjacent end of said conduit.

JULIUS KUTTNER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,034,119	Shebat	Mar. 17, 1936
2,211,795	Sauer	Aug. 20, 1940

FOREIGN PATENTS

Number	Country	Date
772,076	France	Aug. 6, 1934
782,076	France	Mar. 11, 1935
342,257	Great Britain	Jan. 26, 1931