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NOZZLE FOR CARBON BLASTER

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FIG. 1

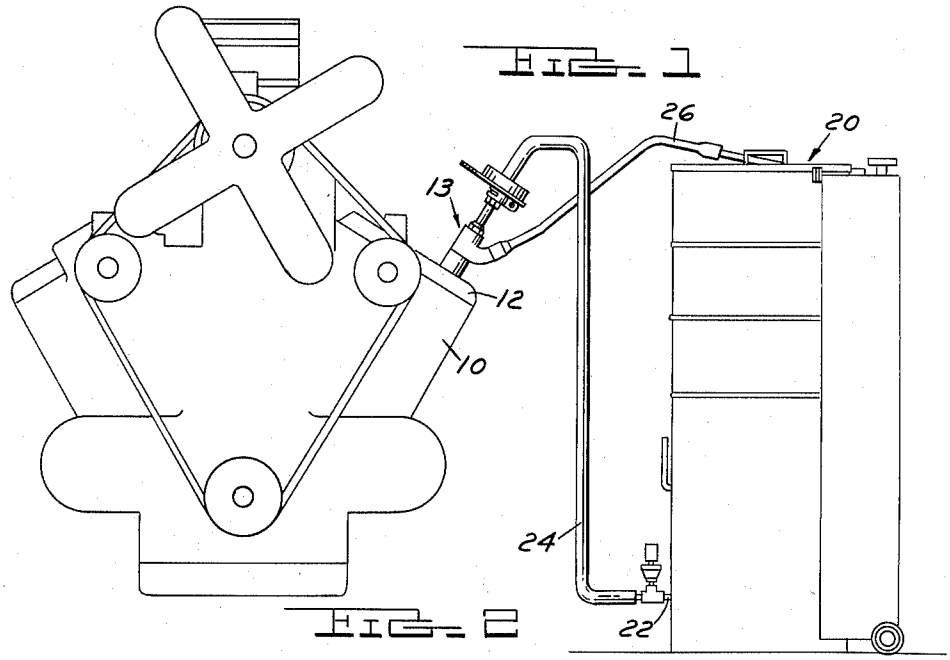


FIG. 2

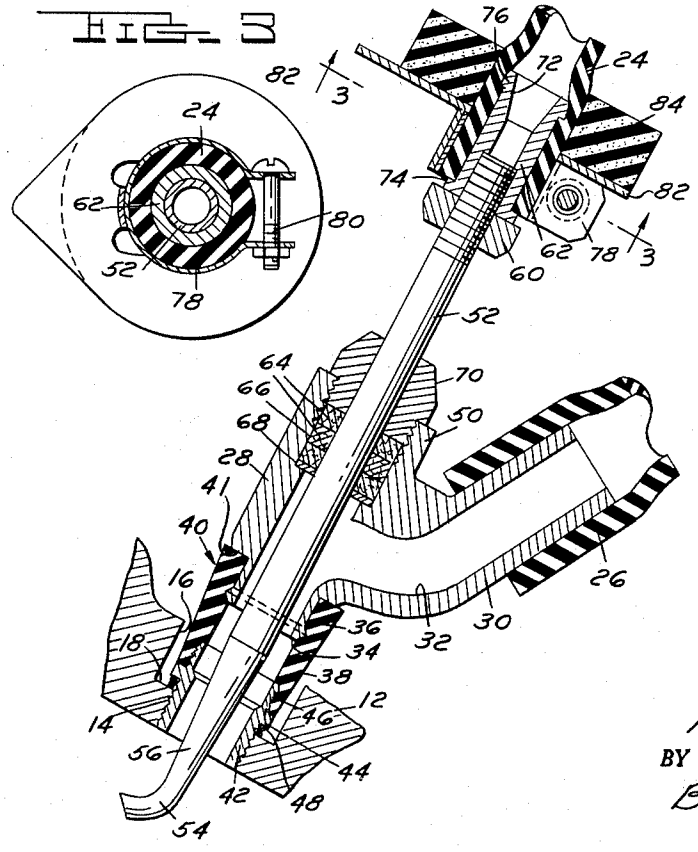
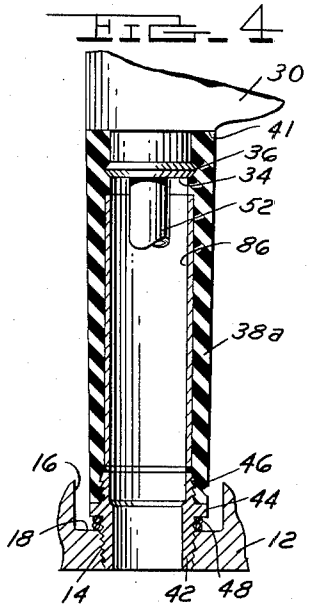


FIG. 3

FIG. 4



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NOZZLE FOR CARBON BLASTER

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8 Claims. (Cl. 51—8)

This invention relates to apparatus for removing carbon from the head and adjacent inner wall surfaces of an internal combustion engine cylinder, and more particularly to an improved blast nozzle assembly for such apparatus.

The apparatus with which my improved nozzle is intended to be used is similar to that disclosed in the United States patent of George M. Graham, No. 2,651,887 dated September 15, 1953. The apparatus therein disclosed comprises a blast nozzle that is manually held over the spark plug opening of an internal combustion engine. Means are provided which deliver blast particles to the nozzle, which then directs the particles against the surfaces of the combustion chamber dislodging the carbon deposits. The nozzle is so constructed that the dislodged carbon and spent blast particles are then exhausted through an opening in the nozzle that surrounds the opening through which the blast particles entered the combustion chamber. The exhausted carbon and spent blast particles are carried from the nozzle by a hose to a place where they are either sifted for reuse of such blast particles as are still usable, or stored to be later discarded.

The present invention relates to improvements in the blast nozzle, and is an improvement upon the above-mentioned Graham patent.

The delivery and exhaust nozzle shown in the above-mentioned patent is provided with a resilient, deformable, tubular end portion disposed on the exhaust line of the nozzle. This end portion is manually held by the operator against the outer surface of the cylinder surrounding the spark plug opening. The delivery or blast line extends axially through the exhaust line and into the combustion chamber.

To direct the blast particles at all portions of the surfaces of the combustion chamber, it is necessary to rock or tilt the delivery or blast line. To permit such tilting or rocking, the resilient end portion of the exhaust line bearing against the outer surface of the cylinder, must be deformable. However, there is a limit to the amount of deformation of such end portion before one edge of the end portion is raised up off the surface of the cylinder. It has heretofore been found that in manipulation by a careless mechanic this limit has been exceeded and one edge of the resilient end of the exhaust line has been raised off the outer surface of the cylinder. Due to such separation at one side of the end of the nozzle from the cylinder face about the spark plug opening, carbon particles and other waste materials that have been dislodged from the surfaces of the combustion chamber are blown out into the atmosphere. Such carbon particles and waste materials, particularly waste materials containing lead, constitute contaminants in the atmosphere which have been found exceedingly dangerous to the mechanic's health.

An object of my invention is the provision of a nozzle which may be placed in communication with the

combustion chamber of an internal combustion engine in a manner such that there is no escape of carbon or waste materials, air or spent blasting material, at the point of connection between the nozzle and the combustion chamber and despite the fact that the delivery line may be twisted and turned or rocked during the blasting operation.

Another object is the provision of a nozzle which is readily attachable and detachable from the spark plug opening in the cylinder wall.

Still another object is the provision of a nozzle which is provided with an adapter element enabling the nozzle to be used on many different types of engines and particularly where the spaces within which the mechanic must work are confined or relatively inaccessible.

Other objects, advantages, and meritorious features will become more fully apparent from the following description, claims and accompanying drawings wherein:

Fig. 1 is a schematic illustration of an internal combustion engine, and mechanism coupled with my improved nozzle to carry out the removal of carbon from the combustion chamber walls;

Fig. 2 is an enlarged cross sectional view of my improved nozzle mounted in a cylinder opening;

Fig. 3 is a sectional view of my nozzle taken on line 3—3 of Fig. 2;

Fig. 4 shows a modified form of the resistingly deformable tubular section of my nozzle.

The schematically shown internal combustion engine in Fig. 1 is provided with a cylinder **10**, and cylinder head **12**. My improved nozzle, generally indicated as **13**, is adapted to be coupled to the cylinder head at the spark plug opening **14** which is usually provided with a counterbore portion **16** having a floor **18**. Generally shown at **20** is a container housing the following elements and which are more particularly described in the above-mentioned Graham patent: a blast particle or granule receptacle having an outlet line **22** leading out through the wall and coupled with the flexible hose **24** which is connected to my improved nozzle; an air pressure line leading to the receptacle and adapted to direct a jet of air therethrough in a manner such that the blast particles are entrained and carried by the air out through line **22** and thence by the hose **24** to the nozzle; and a used granule and dislodged carbon basket, or as might be termed, waste basket, which receives the granules from the exhaust hose **26** leading from my nozzle, and either may sift the granules for reuse or merely store the granules until later discarded.

Therefore, it is now apparent that blast medium comprising an air stream and blast particles entrained thereby, pass out of the container **20**, through hose **24** to my nozzle and into the combustion chamber of the cylinder **10**. The blast particles and air then pass out of the combustion chamber, along with carbon particles and other waste materials dislodged from the combustion chamber walls, through the exhaust line of my nozzle, and by means of hose **26** are led to the waste basket within container **20**.

In carrying out the objects of my invention, the improved nozzle shown in the various figures of the drawings comprises a generally Y-shaped tubular body member **28** formed of metal or other rigid material. One branch, **30**, is adapted to be received within the flexible granule exhaust hose **26**. The passageway **32** through branch **30**, leading downwardly to the lower edge **34** of the body portion, may be termed the granule exhaust line. Adjacent the lower edge **34** of the body, it is shaped to exhibit an annular lip or flange **36** adapted to be yieldingly grippingly received within a complementary groove V-shaped in cross section, formed in

the resistingly deformable or flexible neck portion 38 of the adapter 40.

The resistingly deformable or flexible neck portion 40 of the adapter is formed of rubber or resilient plastic material of a character such that it may be laterally bent or twisted substantially without releasing the grip upon the lip 36 of tubular body 28. By virtue of the engagement of the lip 36 and the groove formed in the flexible neck member 40, and the gripping action of the neck 40 upon the end of the tubular body 28, an air tight seal between the neck and the tubular body 28 is realized. It should be noted that the tubular body 28 is shaped as at 41 to provide a shoulder which bears against the upper end of the flexible neck. The adapter which, when connected to the tubular body, forms a continuation of the exhaust line, comprises a rigid tubular member or nipple 42 adapted to be threadedly received within the spark plug opening. An annular flange 44 encircles the nipple intermediate the opposite ends thereof. The end of the member opposite the threaded end is serrated as at 46 to be grippingly engaged within the lower end of the flexible neck 38. "O-ring" gaskets 48 encircle the nipple 42 and abut the flange 44 to be compressed between it and the floor 18 of the counterbore when the nipple is threaded into the spark plug opening, thereby effecting an airtight seal between the combustion chamber and the exhaust line.

To insure the requisite flexibility and still provide sufficient strength in the walls of the neck to accomplish the connection between it and the tubular body 28, the neck is slightly tapered as shown in Fig. 2. The adapter 40 therefore assumes the character of an airtight, resistingly deformable or flexible coupling between the body member 28, or discharge line 32, and the combustion chamber of the cylinder 10 in the internal combustion engine.

Axially received through the other branch 50 of the member 28 is the granule delivery line 52 shaped at its lower end to form a spout or nozzle 54, bent and shaped to project the blast granules against the surfaces of the combustion chamber. Adjacent the lower end 54 of the delivery line and extending part way upwardly along its length is a tapered portion 56, so shaped for a purpose hereinafter disclosed. The upper end of the delivery line is threaded as at 58 to receive the lock nuts 60 and 62.

Intermediate such threaded portion and the tapered portion, the delivery line is polished so as to form an airtight, yet slidable joint, between it and three felt washers or the like similarly numbered 64 disposed within a counterbore 66 in the branch 50 of the body 28. Bottomed within the counterbore 66 is a steel washer 68, adapted to prevent erosion of the felt washers by action of the granules passing upwardly through the exhaust line. A packing nut 70 threadedly received within the branch 50 is adapted to seal the felt washers against the polished surface of the delivery line.

The nut or sleeve 62 within which the upper end of the delivery line is threadedly received has a tapered bore 72 which narrows to a cylindrical bore communicating with the end of the delivery line. The opposite ends of the nut 62 exhibit annular flanges 74 and 76. Flange 76 is adapted to be grippingly received within the hose 24 and flange 74 is provided to abut the end of the hose. Encircling the hose is a clamp 78 provided with tightening means 80. Overlying the upper edge of the clamp and secured thereto is a plate 82, shaped as shown in Fig. 3 and provided upon its upper face with a sponge rubber disk 84, adapted to provide a soft bumper for the operator's fingers. The plate 82 is shaped in the form of a pointer, and by means of adjustment of the lock nut 60 the spout 54 may be aligned to direct a jet of blast granules in the general direction of the pointer.

As is now apparent, when the operator grasps the hose 24 adjacent the disk 84 he may twist, turn, or incline the delivery line and direct a jet of blast granules against all

the surfaces of the combustion chamber. He may also push the delivery line further down into the combustion chamber or draw it up. By virtue of the tapered portion 56 of the delivery line, the line may be inclined to a substantial degree.

In order to disconnect the body 38 from the adapter, it is only necessary to severely incline the body and forcefully withdraw it therefrom. The reverse procedure will serve to connect the two.

Shown in Fig. 4 is a modified form of neck 38. In this embodiment the neck 38_a is longer than the previously described neck, and is provided within its bore with a tubular member 86, the opposite ends of which are spaced from the nipple 42 and the lower edge 34 of body 28. This tubular member 86 is formed of rigid material and is adapted to reinforce the neck 38_a so that throughout such intermediate portion the neck is relatively stiff. By virtue of the spacing of the ends of the member 86 from nipple 42 and the lower edge 34 of the body member, substantially the same flexibility of movement is obtained as with the previously described embodiment. The embodiment of Fig. 4 is particularly well suited for use with engines where the spark plug opening is inaccessible with the shorter form of adapter.

From the foregoing description it is apparent that I have described a nozzle which, when coupled with the spark plug opening, is sustained in such position without the operator's attendance and which at all times during the nozzle's use seals the connection therebetween, thereby preventing the escape into the atmosphere surrounding the operator of any of the spent blast granules, dislodged carbon, or waste materials.

What I claim is:

1. A carbon blasting machine nozzle assembly for removing carbon from the combustion chamber of an internal combustion engine having an internally threaded spark plug opening comprising, in combination: a tubular body member, an exhaust hose coupled with one end of the body member providing a continuation of the passageway therethrough, a tubular part coupled with the other end of the body member and providing a continuation of the passageway therethrough, said tubular part provided at its outer end with an externally threaded tip adapted to be threadedly sealingly received within the spark plug opening forming an aligned non-displaceable continuation of the passageway through the opening into the tubular part, a granule delivery conduit extending linearly through said body member and tubular part and journaled for rotation within the body member, said tubular part being flexible between its tip and said body member to permit tilting of the body member and the granule delivery conduit with respect to the tip when the tip is threadedly sealingly held within the spark plug opening.

2. A carbon blasting machine nozzle assembly for removing carbon from the combustion chamber of an internal combustion engine having an internally threaded spark plug opening comprising, in combination: a tubular body member, an exhaust hose coupled with one end of the body member providing a continuation of the passageway therethrough, a tubular part sealingly releasably coupled with the other end of the body member and providing a continuation of the passageway therethrough, said tubular part provided at its outer end with an externally threaded tip adapted to be threadedly sealingly received within the spark plug opening, a granule delivery conduit extending linearly through said body member and tubular part and journaled for rotation within the body member, said tubular part being flexible between its tip and said body member to permit tilting of the body member and the granule delivery conduit with respect to the tip when the tip is threadedly sealingly held within the spark plug opening.

3. A nozzle assembly as defined in claim numbered 2 characterized in that the body member is rotatably sup-

ported on the tubular part and sealingly coupled therewith for rotation with respect to the tubular part.

4. A carbon blasting machine nozzle assembly for removing carbon from the combustion chamber of an internal combustion engine having an internally threaded spark plug opening comprising, in combination: a tubular body member, an exhaust hose coupled with one end of the body member providing a continuation of the passageway therethrough, said body and tubular part exhibiting cooperating rib and groove equipments adapted to resistingly hold the body and tubular part together, said tubular part provided at its outer end with an externally threaded tip adapted to be threadedly sealingly received within the spark plug opening forming an aligned nondisplaceable continuation of the passageway through the opening into the flexible tubular part, a granule delivery conduit extending linearly through said body member and tubular part and journaled for rotation within the body member, said tubular part being flexible between its tip and said body member to permit tilting of the body member and the granule delivery conduit with respect to the tip when the tip is threadedly sealingly held within the spark plug opening.

5. A carbon blasting machine nozzle assembly for removing carbon from the combustion chamber of an internal combustion engine having an internally threaded spark plug opening comprising, in combination: a tubular body member, an exhaust hose coupled with one end of the body member providing a continuation of the passageway therethrough, a tubular part releasably coupled with the other end of the body member and providing a continuation of the passageway therethrough, said tubular part provided at its outer end with an externally threaded tip adapted to be threadedly sealingly received within the spark plug opening, a granule delivery conduit extending through said body member and tubular part and journaled for rotation within the body member and for axial slidable movement to project its outer end beyond the tip of the tubular part after the part and body are connected together and to withdraw said outer end into said tip and into proximity with the body member when the part and body member are being connected to or disconnected from each other, said tubular part being flexible between its tip and said body member to permit tilting of the body member and the granule delivery conduit with respect to the tip when the tip is threadedly sealingly held within the spark plug opening.

6. A nozzle assembly as defined in claim numbered 5 characterized in that the granule delivery conduit has an

outer end which is directed substantially radially with respect to the longitudinal axis of the conduit and extends radially for a distance less than the diameter of the passageway through the flexible tubular part, such that the end of the conduit may be completely withdrawn into the flexible tubular part and disposed against the end of the body member.

7. A nozzle assembly as defined in claim numbered 5 characterized in that the granule delivery conduit has an outer end which is directed substantially radially with respect to the longitudinal axis of the conduit and the conduit is tapered from a point spaced inwardly of its outer end to said outer end and is capable of being withdrawn through the tubular part.

8. A carbon blasting machine nozzle assembly for removing carbon from the combustion chamber of an internal combustion engine having a threaded spark plug opening comprising: a body assembly having a first branch conduit adapted to be coupled with an exhaust hose, said assembly having a second branch conduit, a tubular adapter element flexible at spaced points throughout its length and provided at one end with a rigid threaded portion adapted to be threadedly received within the spark plug opening with the other end of the adapter yieldably releasably received over the second branch conduit, means disposed within the flexible adapter to rigidify the same and spaced from the second branch conduit at one end and spaced from the rigid threaded portion at the other end to permit flexing of the adapter within such spaces, and a granule delivery line received through the assembly and extending through the flexible adapter to extend into the combustion chamber.

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