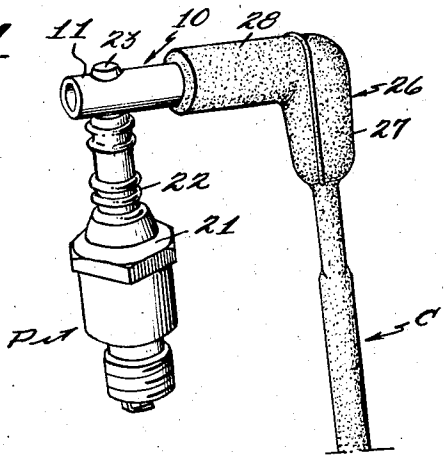
Sept. 23, 1958 J. L. McCORD 2,853,691

TUNE-UP EXTENSION FOR USE WITH SPARK PLUGS FOR TESTING PURPOSES

Filed Jan. 25, 1956

Fig. 1.



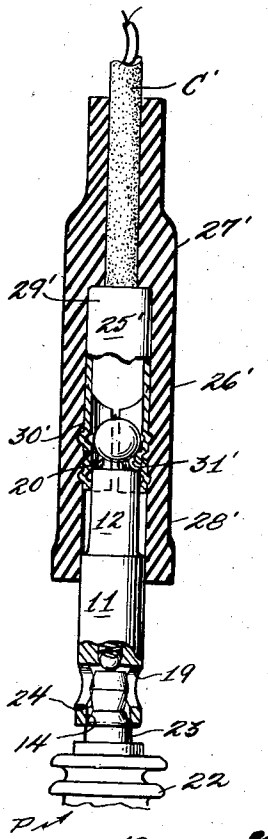


Fig. 4.

Fig. 2.

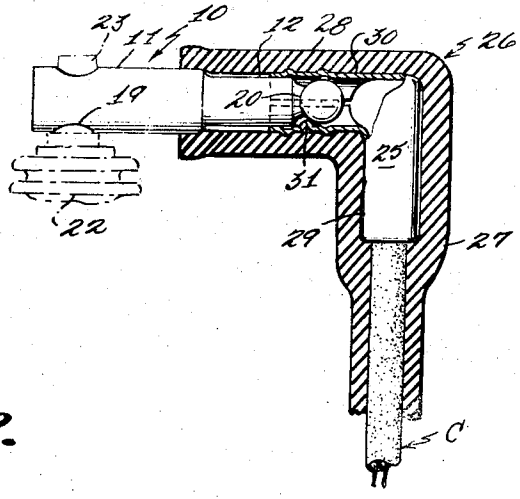
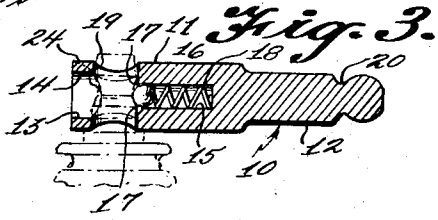


Fig. 3.



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TUNE-UP EXTENSION FOR USE WITH SPARK PLUGS FOR TESTING PURPOSES

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5 Claims. (Cl. 339—252)

This invention relates to ignition systems and has more particular reference to a tune-up extension for use with spark plugs for testing purposes.

In tuning up internal combustion engines having high tension ignition systems and in testing the spark plugs of such systems to see whether they are skipping or are grounded out, and in carrying out various other tests, it is essential that the mechanic have access to the central electrode terminals of the spark plugs or the terminal connections of the spark plug ignition cables.

Todays' modern cars usually have V-type engines and the spark plugs are in an extremely difficult place to reach; in addition, the central electrode terminal of each spark plug is usually covered by a resilient dielectric sleeve-like protective member which fits over the ceramic insulator of the plug and extends for several inches over the ignition cable attached thereto. In some instances, the sleeve is formed integral with the cable and in others it is made separate. In tuning up motors of this type, some mechanics, in order to find a conductor surface for testing purposes, pierce the sleeve with a sharp instrument to get contact with the spark plug electrode, or cut into the cable. In either case, such procedure will permit leakage of moisture into the cable or sleeve and possibly cause faulty performance.

One object of the present invention is to provide a novel tune-up extension especially designed for use in making tests in ignition systems of the class wherein the terminal end of the spark plug cable is covered by a resilient cover member adapted to snugly fit over the upper portion of the insulator of the spark plug when the cable is attached thereto, comprising an elongated metallic member having one end adapted to extend into the sleeve-like protective covering of the terminal end of a spark plug ignition cable and be detachably connected to the cable conductor, and the other end adapted to be detachably attached to the spark plug central electrode terminal, whereby the tune-up extension may be quickly and readily connected to a spark plug and the ignition cable therefor to provide an exposed conductor surface easily accessible for testing purposes.

Another object of the present invention is to provide a tune-up extension device, as characterized above, which is adapted for use with ignition systems of the type described above in which the spark plug cables approach the spark plugs in a transverse direction as well as systems in which the spark plug cables approach the spark plugs in an axial direction.

A further object of the present invention is to provide a tune-up extension, as characterized above, which is relatively simple in construction and can be easily applied to the intended use.

Other objects and advantages of the invention will appear in the following specification when considered in connection with the accompanying drawing, wherein:

Fig. 1 is a perspective view of a tune-up extension connector constructed in accordance with the present invention and showing the manner in which it is used

to connect a conventional spark plug to an ignition cable of the type in which the cable approaches the spark plug in a transverse direction;

Fig. 2 is a side elevational view, partly in cross section, showing the manner in which the tune-up extension is connected to the spark plug cable shown in Fig. 1;

Fig. 3 is a vertical sectional view showing the manner in which the tune-up extension is connected to the spark plug when employed with an ignition cable of the type shown in Figs. 1 and 2; and

Fig. 4 is a side elevational view, partly in cross section, showing the manner in which the tune-up extension shown in Figs. 1, 2 and 3, is employed to connect the spark plug to an ignition cable approaching the spark plug in an axial direction.

Referring now to the drawing, there is illustrated one embodiment of a tune-up extension device constructed in accordance with the present invention and the manner in which it is employed in testing a sprak plug. As there shown, the tune-up extension device comprises an elongated metallic conductor member **10** having one end portion **11** adapted to be detachably connected to the central electrode terminal of a spark plug and the other end portion **12** adapted to be detachably connected to the terminal end of a spark plug cable.

In the particular embodiment of the invention illustrated, the tune-up extension **10** is shown as comprising a cylindrical member, preferably made of aluminum and of about 1¾" in length. The end portion **11**, adapted to be readily attached to and removed from the central electrode terminal of a spark plug, has an axially extending recess or bore **13** formed therein with the outer end portion **14** of the bore having a diameter greater than the diameter of the inner end portion **15** thereof and of a size to slidably receive the terminal end portion of the central electrode of the spark plug so as to form an electrical connection between the members. A metallica ball **16** is movable mounted within the inner end portion **15** of the bore **13** and is normally resiliently held seated against a pair of opposed stop members or projections **17**, extending inwardly from the outer edge of the end wall of the portion **15**, as by means of a coiled metal spring **18** which bears against the ball and the bottom of the bore **13**. The end portion **11** is also provided with a transverse bore **19** which intersects the bore **13** at right angles and is so positioned that the ball **16** projects thereinto when held against the stop projections **17**. The end portion **12** of the cylindrical member **10**, which is adapted to be connected to the terminal connector of a spark plug cable, is made of a size and shape generally conforming to the size and shape of the terminal end portion of the central electrode of the spark plug and is shown as having a circumferential groove **20** formed thereon adjacent its outer end for a purpose hereinafter to be described.

In Figs. 1, 2 and 3, there is illustrated the manner in which the tune-up extension is employed to connect the central electrode terminal of the spark plug to the ignition cable thereto in ignition systems of the type in which the ignition cable approaches the spark plug in a transverse direction with respect to the central electrode terminal of the plug and carries a snap-on terminal connector housed in an elbow-shaped tubular shield having one end portion adapted to snugly fit over the upper end portion of the porcelain insulator when the snap-on terminal connector is connected to the central electrode terminal of the plug. As there shown, the spark plug P, which may be of any usual type, includes a metal base **21** having a threaded lower end for securing in the usual cylinder head or block of an engine, not shown, a ceramic insulator **22** carried by the base and enclosing the central electrode, the upper terminal end **23** of which extends above the insulator and is provided with a circumferential

groove 24 for receiving resilient detent means carried by the connector of the ignition cable to provide a snap-on connection between the two members.

The spark plug ignition cable C has the terminal end of its conductor connected to a snap-on type connector 25 which is enclosed in an elbow-shaped tubular shield fitting 26 made of elastic dielectric material such as rubber or neoprene or the like.

The tubular shield fitting 26 includes an upper leg 27 which extends over and embraces the end portion of the insulating covering of the cable C and a lower leg 28 which is adapted to snugly fit over the insulator 22 of the spark plug.

The snap-on terminal connector 25 may be of any usual construction and is shown in the form of a right angle tubular member having its upper leg 29 extending into the upper leg portion of the shield fitting and connected to the end of the conductor of the ignition cable in any suitable manner and having its lower leg 30 extending into the lower leg 28 of the shield fitting in position to engage the terminal end 23 of the central electrode of the spark plug when it is reecived in the lower leg of the shield fitting. The lower leg 30 of the connector 25 is slotted to make it more resilient and carries one or more inwardly projecting detents 31 adapted to engage in the groove 24 of the eletcrode terminal 23 to make a snap-on connection between the two members.

In using the tune-up extension of the invention with ignition systems of the type illustrated in Figs. 1 and 2, the end portion 12 of the tune-up extension is inserted into the lower leg 28 of the shield fitting 26 and into the lower leg of the connector 25 until the detents 31 of the connector 25 are resiliently pressed into the groove 20 formed on the end portion 12 of the tune-up extension to make a snap-on connection between the two members which is easily made and broken, yet provides a good electrical connection between the two members. The end portion 11 of the tune-up extension is mounted on the spark plug with the terminal end 23 of the central electrode received in and extending through the transverse bore 19 therein, and with the bail 16 being spring pressed into the groove 24 formed in the electrode terminal, thus forming a secure snap-on connection which may easily be made or broken and provides a good electrical connection between the two members.

In Fig. 4 there is illustrated the manner in which the tune-up extension is employed to connect the central electrode terminal of a spark plug to the ignition cable thereto in ignition systems of the type in which the ignition cables approach the spark plug in an axial direction with respect to the central electrode terminal and carries a snap-on terminal connector housed in a resilient sleeve-like covering adapted to snugly fit over the upper end portion of the insulator of the spark plug when the snap-on terminal connector is connected to the electrode terminal of the plug.

As there shown, the spark plug P' is identical in construction to the spark plug P shown in Fig. 1, and includes the ceramic insulator 22 carried by the base and enclosing the central electrode, the upper terminal end 23 of which extends above the insulator and is provided with a circumferential groove 24.

The spark plug ignition cable C' has the terminal end of its conductor connected to a snap-on type connector 25' which is enclosed in a tubular shield fitting 26' made of elastic dielectric material such as rubber, neoprene, or the like. The tubular shield fitting 26' includes an upper portion 27' which extends over and embraces the end portion of the insulating covering of the cable C' and a lower portion 28' which is adapted to fit over the insulator 22 of the spark plug. The snap-on connector 25' may be of any usual construction and is shown in the form of a metal tubular member having its upper end portion 29' extending into the upper portion 27' of the shield fitting

and connected to the end of the conductor of the ignition cable in any suitable manner and having its lower end portion 30' extending into the lower portion 28' of the shield fitting in position to engage the terminal end 23 of the central electrode of the spark plug when it is received in the lower end portion of the shield fitting. The lower portion 30' of the connector 25' is slotted to make it more resilient and carries one or more inwardly projecting detents 31' adapted to engage in the groove 24 of the electrode terminal 23 to make a snap-on connection between the two members.

In using the tune-up extension of the invention with ignition systems of the type illustrated in Fig. 4, the end portion 12 of the tune-up extension is inserted into the lower portion 28' of the shield fitting 26' and into the lower end portion 30' of the connector 25' until the detents 31' are resiliently pressed into the groove 20 formed on the end 12 of the tune-up extension to make a snap-on connection between the two members. The end portion 11 of the tune-up extension is mounted on the spark plug with the terminal end 23 of the central electrode received in the enlarged portion 14 of the axial bore 13 formed therein, with the extreme end of the terminal 23 engaging the ball 16 mounted in the upper portion 15 of the axial bore 13, thereby insuring a good electrical connection between the tune-up extension and the central electrode terminal.

From the foregoing, the manner of using the tune-up extension in testing a spark plug is believed apparent. The mechanic merely has to disconnect the ignition cable from the plug and connect the tune-up extension to the plug and cable, as above described. He will then have an exposed conductor surface to do his testing without going to a lot of trouble and possibly injuring the shield protector or ignition cable, or burn his hands searching for a place of contact.

The invention further contemplates the provision of a set of tune-up extensions for use with ignition systems of the type described herein, so that each spark plug may be connected to its ignition cable by a tune-up extension, thus facilitating the setting of the timer, detecting motor noises and performing various other tests.

Obviously, the invention is not restricted to the particular embodiment thereof herein shown and described, but is capable of many changes within the scope of the appended claims.

What is claimed is:

1. For use in an ignition system of the class wherein each spark plug ignition cable has a snap-on connector housed in an elongated sleeve-like shield member made of resilient dielectric material and having one end portion adapted to fit over the upper portion of the spark plug insulator when the snap-on connector of the cable is connected to the central electrode of the spark plug, the combination with said sleeve-like shield member of means for providing an easily accessible contact surface in the ignition circuit to the spark plug for testing purposes, comprising an elongated metal tune-up extension member having one end portion conforming generally in size and shape with the central electrode terminal of the spark plug, said one end portion being mounted in said sleeve-like shield member and being detachably connected to the snap-on terminal connector therein, and the other end portion of said tune-up extension member projecting outwardly from said sleeve-like shield member and being detachably connected to the central electrode of the spark plug.

2. Apparatus as set forth in claim 1, wherein the end portion of said tune-up member extension projecting outwardly from said sleeve-like shield member is provided with a transverse bore in which the terminal of the central electrode of the spark plug is slidably received to make a detachable connection therebetween.

3. Apparatus as set forth in claim 1, wherein the end portion of said tune-up extension member projecting

outwardly from said sleeve-like shield member is provided with an axial bore in which the terminal of the central electrode of the spark plug is slidably received to make a detachable connection therebetween.

4. Apparatus as set forth in claim 1, wherein the end portion of said tune-up extension member projecting outwardly from said sleeve-like shield member is provided with an axial bore and a transverse bore which intersects at right angles, in either of which bores the terminal of the central electrode of the spark plug is slidably received to make a detachable connection between the spark plug central electrode and the tune-up extension member; and wherein resilient detent means are carried by the tune-up extension member and positioned to be urged into contact with the terminal of the central electrode when it is received in either of the two bores.

5. Apparatus as set forth in claim 4, wherein said resilient detent means includes a metal ball mounted in said axial bore; stop means for retaining the ball in said axial bore and positioned to permit the ball to project part way into said transverse bore when the ball engages the stop means; and a coiled metal spring mounted in said axial bore normally resiliently holding said ball pressed against said stop means, the construction and arrangement being such that said resilient detent means insures good electrical connection between said tune-up extension member and the terminal of the central electrode of the spark plug when said terminal is received in either of the two bores.

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