July 14, 1931. A. H. FISHER 1,813,918

COMBINATION REPAIR APPARATUS

Filed March 28, 1927 2 Sheets-Sheet 1

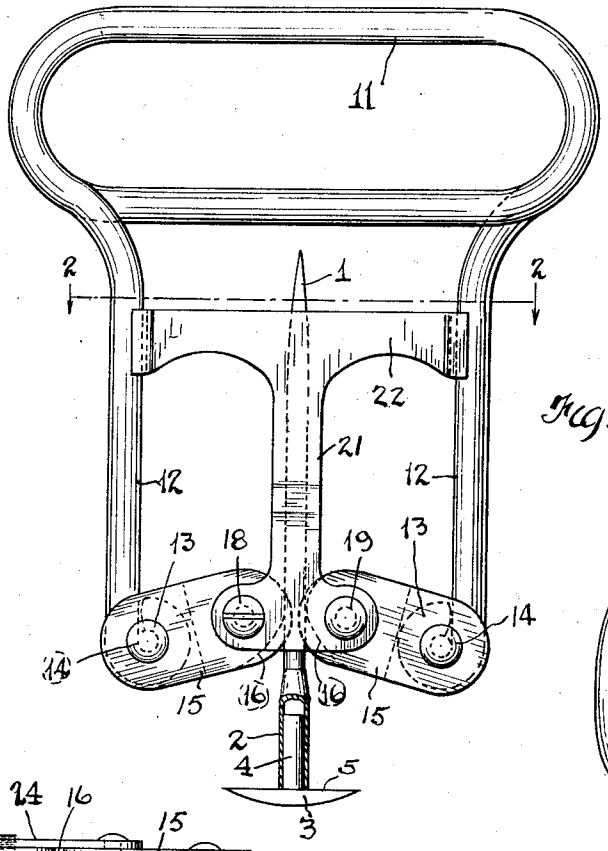


Fig. 1

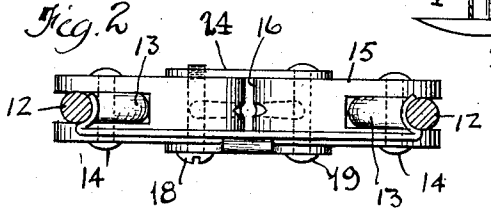


Fig. 2

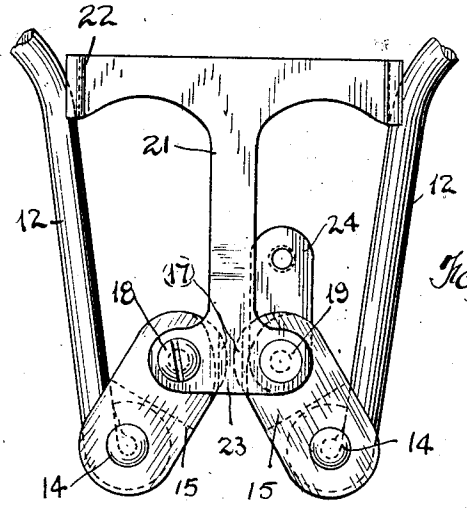


Fig 4

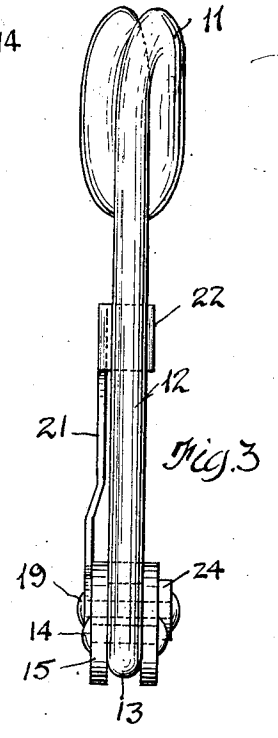


Fig. 3

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COMBINATION REPAIR APPARATUS

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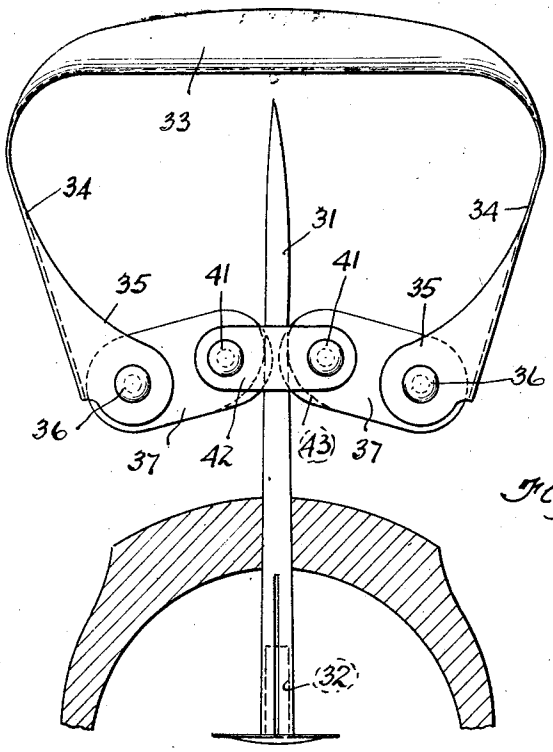


Fig 5

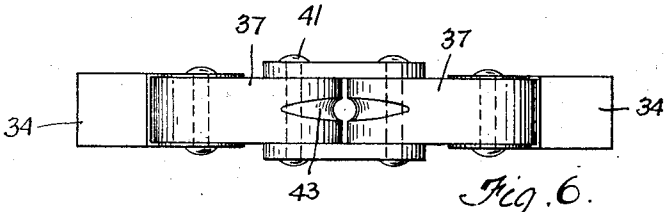


Fig. 6.

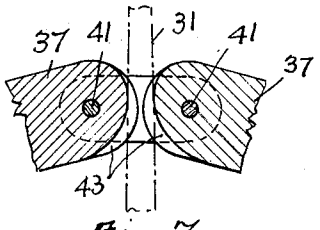


Fig. 7.

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UNITED STATES PATENT OFFICE

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COMBINATION REPAIR APPARATUS

Application filed March 28, 1927. Serial No. 178,928.

This invention as indicated relates to a repair apparatus. More particularly it comprises an apparatus peculiarly adapted for inserting plugs in puncture apertures of the casings of automobile tires. In its preferred form, the apparatus comprises an elongated inserting instrument or needle preferably tapered adjacent one end and having a recess at its opposite end to receive the stem of a puncture plug, which cooperates with the base of said needle to form a pad for inserting said needle initially through the tire casing, and a device adapted to engage the inserted end of said needle as it projects through the tire casing to seat or assist in seating said plug in puncture closing relation to the puncture hole.

The invention includes a number of special features in connection with the clamping device which adapts the same to engage a tapered needle over an extended area and to effectively grip a tapered needle, irrespective of the exact point of engagement. Certain features of the apparatus obviously may in some instances be used as independent units, but they primarily are intended to cooperate in the manner already indicated. Thus, the gripping device may be utilized to engage a rod or wire of indeterminate length, the engagement being accomplished by opening one of the spacing plates so as to permit the elongated article to be inserted between the jaws, after which the plate is reengaged. Other uses for the apparatus as a whole and in its several parts will appear in the course of the following description.

The action of the gripping device will be automatic in its engagement of the object by virtue of the spring action upon the jaws. The positive release of the jaws is provided for by means of a combined guide and control member, embodied as a part of its construction. Other and further objects of the invention will appear in the course of the following description. To the accomplishment of the foregoing and related ends, said invention, then consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain means of carrying out the invention, such disclosed means illustrating, however, but several of various ways in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a side elevation of a combination repair apparatus embodying the principle of my invention; Fig. 2 is a plan view taken along the line 2—2 shown in Fig. 1, looking in the direction of the arrows, a portion being shown in section; Fig. 3 is an end elevation of the device shown in Fig. 1 as viewed from the left hand side of Fig. 1; Fig. 4 is a side elevation of the lower portion of a clamping tool somewhat similar to that shown in Fig. 1, but with portions of the jaw flanges cut away to admit a wire or bar of larger diameter than the jaws would normally receive; Fig. 5 is a side elevation of a modified form of combination repair apparatus; Fig. 6 is a bottom plan view of the gripping tool shown in Fig. 5; and Fig. 7 is a detailed view, partly in section, showing the tapered grooves in the gripping jaws of said clamping tool.

As is clearly shown in Fig. 1 of the drawings, my preferred form of apparatus comprises a tapered inserting tool or needle 1, but having a recess 2 in its lower end to receive the stem of the rubber plug 3, preferably of mushroom shape. The stem 4 of the plug is preferably adapted to engage in a snug fit within the recess of the tool to its full extent with its head portion 5 resting against the lower end of the needle, and providing a pad of substantial thickness against which pressure may be brought to force the point or inserting end of the needle through the puncture aperture. The needle as shown in Fig. 1 is provided with a cylindrical recess or socket with unslotted and therefore non-resilient side walls. The needle shown in Fig. 5 has lateral slots and the side walls accordingly are resilient.

The tool may be formed with a solid upper end or may be formed of sheet material of suitable gauge bent to the desired form, the recess or socket, in such instance, extending throughout the length of the instrument, although the effective portion thereof will be

that adjacent the base, within which the plug stem may be received.

The plug forming a part of the apparatus differs from plugs heretofore used in the repair of air tubes for bicycle tires in that the head thereof is of sufficient thickness to serve as a pad to force the instrument through the tire casing and would be utterly incapable of being folded to the small size required to force it head first through a single tube bicycle tire. The function of the head likewise differs from that of the head of a plug utilized for air tube repair in that it is not primarily intended to be used as a patch cemented to the inner walls of the object through which the stem of the plug is engaged and providing an air seal, but serves instead as a shield for the plug stem while the stem seals the puncture. The bicycle plug stem serves merely as an inserting member and is not itself engaged with sufficient firmness to the walls of the puncture aperture to serve as a permanent closure to prevent the ingress of grit or grains of sand and the like.

In the present invention, the closure of the puncture aperture is effected by the interengagement in self-conforming relation of the torn walls of the puncture hole with the resilient stem portion of the plug. This engagement is effected by inserting the stem of the plug directly within the puncture aperture with a minimum of expansion of the walls of the puncture hole.

As set forth in my Patent No. 1,570,298, January 19, 1926, the puncture aperture may be closed by compressing the stem of the plug and simultaneously expanding the walls of the puncture aperture and thereafter releasing into progressively self-conforming relation the two adjacent walls so compressed. The reference to compression of the rubber stem and casing walls is to be understood as including deformation of the stem inasmuch as rubber is substantially incompressible. The head of the puncture plug as stated is intended to serve as a shield and anchoring device rather than as a patch or air seal as in the case of repair plugs for bicycle air tubes heretofore referred to.

The gripping device shown in Figs. 1, 2 and 3 of the drawings comprises a handle portion 11 preferably formed of wire of heavy gauge and having its respective ends 12 extending downwardly in parallel relation to each other and terminating in eyes 13, adapted to receive pivot pins 14 by means of which a pair of clamping jaws 15 is supported. The clamping jaws are suitably slotted at their outer ends to receive the eye portions of the handle extensions and at their inner ends are provided with cam grooves 16, which increase in depth and width to a point somewhat outwardly of their lower edge.

The extreme lower corners 17 of the walls adjacent the cam groove may be cut away on adjacent jaws at either side of the tool so as to leave ample space for the admission of a wire or bar to the cam grooves when the jaws are in their most elevated position as is clearly shown in Fig. 4 of the drawings. The inner ends of the jaws are held in uniformly spaced positions by means of a pair of pins 18, 19, extending through suitable apertures in said jaws and mounted in the base of a T-shaped member 21.

Said member 21 comprises a plate in the form of a T, the top bar of which is bent upon itself adjacent each end to provide guide members 22 adapted to partially embrace the extension portions 12 of the handle. The main stem of said plate terminates in a short base member 23 suitably apertured adjacent its ends to receive pivot pins 18 and 19 heretofore mentioned. On the opposite sides of said jaws, an elongated plate 24 is provided, said plate being engaged by the opposite ends of said pivot pins 18 and 19. The pivot pin 18 is preferably in the form of a bolt having a slotted head at one end and having a screw-threaded portion at its opposite end. The screw-threaded portion, as is clearly shown in Fig. 2 of the drawings, is adapted to engage a screw-threaded hole in the plate 24. Said plate 24 is thus detachable at one end and may be moved to the position shown in Fig. 4 at such time as it is desired to engage a wire or rod of larger diameter between the jaws. After such rod is placed in position between the cam slots of the jaws, the plate 24 may be lowered and locked in position upon the pin 18.

The modified form of construction shown in Figs. 5, 6 and 7 of the drawings, comprises a tapered inserting tool or needle 31, having a recess or socket 32 in its base to receive the stem of a plug preferably identical in form with that shown in Fig. 1. The lateral walls of the socket are slotted and the needle is therefore adapted to receive stems of various sizes, and to compress the same as the plugs are drawn into puncture closing position. The gripping tool is provided with jaws which cooperate with the tapered needle irrespective of the exact point of engagement. The gripping tool includes a handle portion 33, having a pair of resilient lateral extensions 34 provided at their lower ends with pairs of ears 35 perforated to receive pivot pins 36 upon which the jaw members 37 are mounted respectively. The jaw members are provided adjacent their ends with transverse apertures at points concentric with said grooved ends, the apertures in the ears 35 being engaged over the pivot pins 36 and the other apertures in the jaws receiving pins 41, the ends of which pins engage through a pair of link plates 42 which serve

to hold said jaws slightly spaced from each other.

As is clearly shown in Fig. 6, each jaw is provided on its inner end face with a tapered groove 43. The groove 43 preferably extends over the entire forward end of each of the jaw members beginning with a groove of narrow width and short radius adjacent the upper face and formed of greater width and longer radius progressively in a downward direction, the groove preferably terminating at a point slightly beyond a vertical plane through the pivot pin 41. Thus the tool when applied to the smaller tapered portion of an object such as a tire casing needle will become seated upon said needle at a point wherein its groove will conform substantially to the curvature of the needle. If the extreme end of the tool is engaged, that portion of the groove having a transverse arc on the shortest radius will engage the tool, while if the jaws are moved to a point where the needle is relatively thick, a portion of the groove having a transverse arc of larger radius conforming to such larger curvature of the needle will be engaged therewith. Thus deformation of the needle will be avoided and a maximum of gripping surface of the clamping jaws will at all times be available for use irrespective of the position of the said jaws upon the needle. The grooves in the jaws of both the preferred and modified forms of the apparatus are substantially identical.

The handle portion 33 of the construction shown in Fig. 5, is preferably made of sheet metal bent to half-round curvature about the body portion and having its end extensions 34 formed of spring metal.

The lower ends of the handle in each form of construction are preferably normally spaced from each other a distance slightly greater than the maximum distance between the outer ends of the respective jaws as assembled. Thus when the pivot pins at one end are placed in position, the spring arms must be pressed slightly together to permit the engagement of the opposite pivot pins. In this manner a constant tension is placed upon the jaws, and when it is desired to grip an object such as a tapered needle, it is only necessary to force the gripping tool downwardly over the needle and pull in the opposite direction when the desired point of engagement has been reached, and the jaws will automatically engage upon such reverse motion of the gripping device.

To disengage the jaws in the modified form of construction, it is necessary to press the tool toward the base of the object being gripped and to hold the resilient arms of the handle toward each other while the tool is being withdrawn from the free end of said object.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A gripping tool having in combination a handle having spring extensions, gripping jaws pivotally mounted on said extensions, means holding the inner ends of said gripping jaws in uniform spaced relation to each other and tapered cam grooves formed in the adjacent end faces of said gripping jaws for engaging the tapered surface of an object at any one of a plurality of points along its length.

2. A gripping tool having in combination a section of wire looped centrally to provide a handle and having extensions providing parallel guides and formed with terminal eyes, gripping jaws pivotally mounted in said eyes, cam faces formed on the free ends of said jaws, and means engaging said free ends of said jaws and cooperating with said parallel guides for operating said jaws.

3. A gripping tool having in combination a section of spring wire looped centrally to provide a handle and having extensions providing parallel guides and formed with terminal eyes, gripping jaws pivotally mounted in said eyes, cam faces formed on said gripping jaws, and means slidably engaging said parallel guides and spacing the free ends of said gripping jaws for releasing said jaws from engagement with an object against the outward pressure of wire handle extensions.

Signed by me this 25th day of August, 1926.

ALBERT H. FISHER.