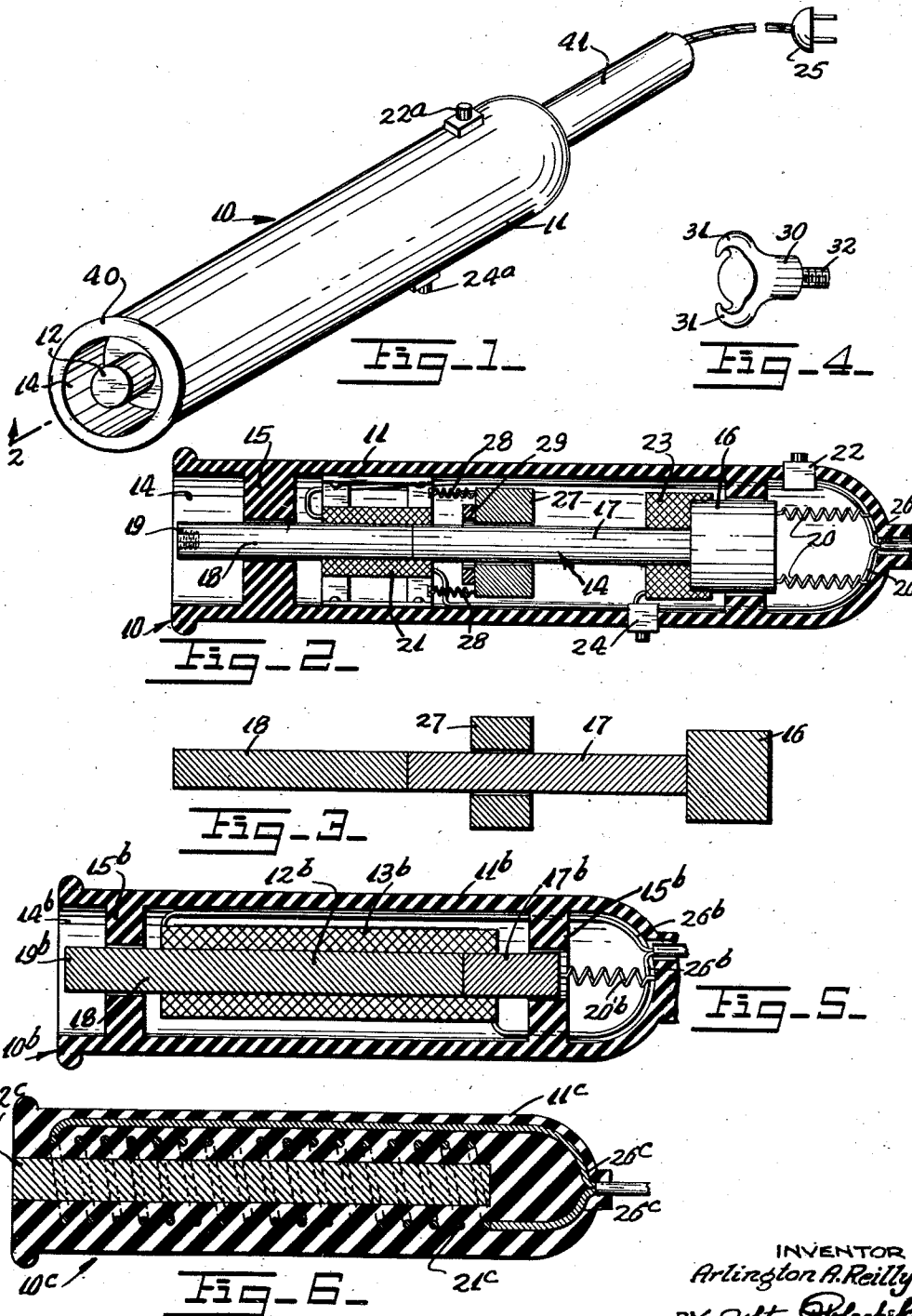


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MAGNETIC NAIL PULLER
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MAGNETIC NAIL PULLER

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6 Claims. (Cl. 254—18)

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This invention relates to an article for removing nails and the like, and in particular relates to an electromagnetic nail puller.

According to this invention there is provided a new automatic nail puller operating to remove nails from wood and the like by means of electromagnetic action. According to one embodiment of the invention, a nail is caused to adhere to a sliding armature by means of magnetic attraction and the armature is caused to slide, removing the nail from a substance in which it is embedded, likewise by magnetic attraction.

It is likewise contemplated by the invention that an additional means such as claws and the like may be used to increase the grip on the nails; similarly it is contemplated that additional urging force, such as, for example, an electromagnetically activated hammer may be used for the removal of stubbornly embedded nails and the like.

It is an object of this invention to provide an electro-magnetic nail puller.

It is a further object of this invention to provide an electro-magnetic nail puller comprising a longitudinally sliding armature positioned within an electric coil, whereby a pulling force may be exerted on a nail or the like.

Additional objects of the invention will in part be shown in the following description and will in part be obvious therefrom, as will also the construction and operation of a nail puller according to this invention.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

Fig. 1 is an isometric view of a nail puller according to one embodiment of this invention.

Fig. 2 is a cross section of the device shown in Fig. 1 taken along the line 2—2.

Fig. 3 is a longitudinal cross section of an armature of the device shown in Figs. 1 and 2.

Fig. 4 is an isometric view of the head of an armature according to a different embodiment of the invention wherein a claw-like member provides additional gripping means to the nail puller.

Fig. 5 is a longitudinal cross section of a nail puller according to a further embodiment of the invention.

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Fig. 6 is a longitudinal cross section of a nail puller according to a still further form of the invention.

Referring to the figures in detail, there is shown in Figs. 1 and 2 a nail puller generally designated 10 according to one form of the invention. This nail puller 10 comprises generally an insulating case 11 in which is slidably mounted an armature 12. The armature is positioned toward one end of the case 11 which has an opening 14 to permit passage therethrough of the armature and to permit entrance therein of a nail or the like which is removed by the device.

The case is constructed of an insulating structural material such as, for example, hard rubber, Bakelite or other thermo-setting resin, a thermoplastic resin, a cellulose plastic, wood, or the like. The case optionally is decorated and decorative in appearance, and preferably is of a size to be easily contained in the hand of an operator. The case is hollow, in order to contain the armature, and in addition to contain coils, switches and the like as will be described hereinafter. Since the hollow of the case is preferably considerably larger than the diameter of the armature, and since it is generally desirable that the armature should fit reasonably snugly therewithin, a plurality of supports 15, optionally of the same material as the case, provide transverse support for the armature and permit longitudinal sliding thereof.

The armature as shown in Figs. 2 and 3 comprises three sections: the rear section which is positioned furthest within the case is a shoulder 16, and is optionally either a ferro-magnetic material or a non-magnetic material. The purpose of this shoulder is to provide a striking surface for a ring-hammer as will be hereinafter described. Adjacent to the shoulder is an intermediate section or rod 17, which is preferably constructed of a non-magnetic material such as, for example, a non-magnetic steel, aluminum, brass, or the like. The front section 18, of the armature, nearest to the open end 14 of the case 11, is a highly ferro-magnetic material such as, for example, soft iron, or preferably one of the highly ferro-magnetic alloys which are frequently used in the construction of electro-magnets. The choice of the ferro-magnetic material is within the ability of one skilled in the art, and accordingly, it is not within the purpose of this description to define the list of satisfactory materials.

The three sections of the armature are in-

tegrally mounted one on the other by conventional means. The sections may be removably mounted together for example by being threaded and screwed together; alternatively they may be permanently mounted together by welding or the like. It is necessary, however, that the sections be firmly joined, to withstand a shock which will be experienced in the removal of a nail.

The armature is slidably mounted within the case, with an end 19 substantially at the opening 14 of the case, and optionally a spring 20 is mounted on the armature to urge it mildly toward the opening. In this, its normal position, the armature is positioned to contact a nail or similar object near which the case is placed. Surrounding the ferro-magnetic core 18 of the armature, and preferably somewhat to the rear thereof is an electric coil 21 which is connected through a switch 22 to an electric power source (not shown). Likewise surrounding or positioned near the shoulder 16 is another coil 23 which also is connected to the power source through switch 24 and optionally also through switch 22 as well. The power source is a relatively strong direct current source such as, for example, a 220 volt commercial current which may be contacted with a conventional plug 25 which is located at the end of wires 26 leading from the device.

A highly ferro-magnetic ring or hammer 27 is slidably positioned around the intermediate portion 17 of the armature, and is adapted to slide within coil 23 and strike shoulder 16. A spring 28 urges this hammer 27 away from the shoulder, seating it against a stop 29 mounted within the case.

The current to coils 21 and 23 is controlled by conventional means such as switch buttons 22^a and 24^a which respectively operate switches 22 and 24. Switch 22, which operates coil 21 (which in turn energizes the core on the armature 12) is preferably capable of being snapped on and off, remaining one way or the other until deliberately thrown. Switch 24, on the other hand, is preferably of the button type, being closed only while the button 24^a is depressed. Thus, switch 24 is readily adapted to be closed for a series of short periods. Case 11 is provided at its open end with a flange 40 to protect the fingers of the user against possible accident. The closed end of case 11 is provided with an extended portion 41 which serves as a gripping handle when the nail puller is in operation.

In the use and operation of the nail puller described in these figures, the device 10 is placed against the nail to be drawn, and switch 22 is closed, thereby energizing coil 21. This causes the ferro-magnetic core of the armature to become a string magnet, strongly attracting the nail. In many cases, this magnetic attraction, coupled with the fact that the position of the coil behind the core tends to withdraw the armature within the case, is sufficient to draw out the nail. However, in the average case, this may not be the fact, and in such instances, the effect of hammer 27 is utilized. This is accomplished by touching the button 24^a to momentarily activate coil 23. This momentary activation draws hammer 27 toward the coil, causing it to strike sharply against shoulder 16, thereby exerting a shock pulling force on the nail. In the case of extremely stubborn nails, several repetitions of the shock pulling force may be needed to remove the nail.

When the head of the nail is buried under the surface of an object, the same procedure is fol-

lowed, and even in these difficult circumstances the nail will be readily withdrawn. This is accomplished without marring the surrounding surface of the object. Similarly, the construction of the present invention may be satisfactorily used for withdrawing railroad spikes by merely enlarging the size of the puller.

In Fig. 4 there is shown a head 30 which is adapted to be used on an armature according to another form of the invention. This head is characterized by having claws which serve to grip a nail firmly and mechanically, to provide a sure and certain holding of the nail. Suitably, this head may be integrally mounted on the armature and may be a permanent part thereof, or alternatively as shown in the figure it may be adapted to be removably positioned on the end of the armature by means of screw threads 32 or the like. This claw head 30 is adapted for use on any of the embodiments of the invention.

The claw head 30 shown in Fig. 4 may be constructed of a ferro-magnetic material such as is used for the core 18 of the armature, in which case its gripping force on the nailhead is enhanced. On the other hand, it is within the scope of this invention to use a non-magnetic claw head on the armature, in which case the claw grip on the nail head is, in itself, sufficient to remove the nail.

In Fig. 5 there is shown a simpler form of the invention, wherein the nail puller comprises essentially a case 11^b, an armature 12^b slidably mounted therewithin, and a coil 21^b surrounding the armature. The armature runs substantially the length of the case, and is optionally ferro-magnetic along its entire length. In the embodiment shown in the figure, a short section 17^b toward the closed end of the case is constructed of a non-magnetic material, such as, for example, aluminum or the like. The purpose of this section at the end is to insure that the ferro-magnetic portion of the armature is substantially in front of the coil, so that the activated coil will exert a withdrawing force on the armature itself. A spring 20^b exerts a small force urging the armature toward the open end of the case 11^b so that the tip 19^b of the armature will be positioned to contact the head of the nail. Supports 15^b and wire 26^b are similar in nature and purpose to the corresponding members in the previous form of the invention.

In the use of this form of the invention power is turned on alternatively by means of a switch (not shown) or by plugging in a plug on the end of wire 26^b. This causes the armature 12^b to become magnetically activated thereby drawing the nail, and simultaneously causes the armature to be withdrawn into the case 11^b, whereby a positive mechanical force acts on the nail. Obviously, the claw head 30 shown in Fig. 4 may be used on this form of the invention.

Fig. 6 is a still further form of the invention wherein the coil 21^c and armature 12^c are imbedded by molding or the like in a case 11^c. In this form of the invention, the armature is stationary within the case, and the device acts as follows: Coil 21^c is energized, causing armature 12^c to become activated magnetically. The working end of the device 10^c is placed against the nail head, and the device is then turned to one side, drawing the armature 12^b away from the surface in which the nail is embedded. This necessarily exerts a pulling force to remove the nail.

It will be obvious that various parts and methods may be interchanged from one form of the

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invention to another, and that numerous variations of the invention will be within the ability of one skilled in the art. For example, the specific design of the claw head 30 as shown in Fig. 4 is subject to wide variations not involving invention. Similarly, numerous other variations will be obvious.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claims.

Having thus described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. An electro-magnetic nail puller comprising an insulating case, an electric coil positioned within said case, a rod-like armature slidably positioned within said case and said coil, said armature having a shoulder mounted thereon and a hammer positioned to be magnetically urged to strike said shoulder.

2. An electro-magnetic nail puller comprising an insulating case open at one end, an electric coil positioned within said case, a rod-like armature slidably positioned within said case and said coil, said armature having a shoulder mounted thereon and a hammer positioned to be magnetically urged to strike said shoulder urging said armature suddenly away from the open end of said case.

3. An electro-magnetic nail puller comprising an insulating case open at one end, an electric coil mounted within said case, an armature slidably positioned within said coil and said case, said armature having a claw-like head mounted on the end adjacent to the open end of said case.

4. An electro-magnetic nail puller comprising an insulating case open at one end, an electric coil mounted within said case, an armature slidably positioned within said coil and said case, said armature having a claw-like head mounted on the end adjacent to the open end of said case and having a shoulder mounted thereon and, a

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hammer positioned to be magnetically urged to strike said shoulder urging said armature suddenly away from the open end of said case.

5. An electro-magnetic nail puller comprising an insulating case open at one end, an armature longitudinally slidably positioned therein, said armature having a highly ferro-magnetic core at the end adjacent to the open end of said case, a non-magnetic intermediate portion and a shoulder positioned at the other end of said armature, an electric coil surrounding said ferro-magnetic core, a second electric coil positioned at said shoulder, and a ferro-magnetic ring like hammer positioned around said intermediate portion and adapted to be magnetically urged to strike said shoulder when said second coil is activated, whereby said armature is suddenly driven within said case.

6. An electro-magnetic nail puller comprising an insulating case open at one end, an armature longitudinally slidably positioned therein, said armature having a highly ferro-magnetic core at the end adjacent to the open end of said case, a non-magnetic intermediate portion and a shoulder positioned at the other end of said armature, an electric coil surrounding said ferro-magnetic core, a second electric coil positioned at said shoulder, an electric switch to close an electric circuit activating said first coil and a second electric switch to momentarily close an electric circuit activating said second coil, a ferro-magnetic ring like hammer positioned around said intermediate portion and adapted to be magnetically urged to strike said shoulder when said second coil is activated, whereby said armature is suddenly driven within said case.

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