Dec. 9, 1958 R. J. KOPF ET AL 2,863,149

APPARATUS FOR SECURING HANGERS WITH EXPLOSIVELY-ACTUATED TOOLS

Filed April 18, 1955

FIG 1

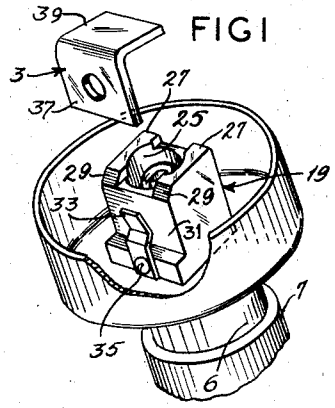


FIG. 2.

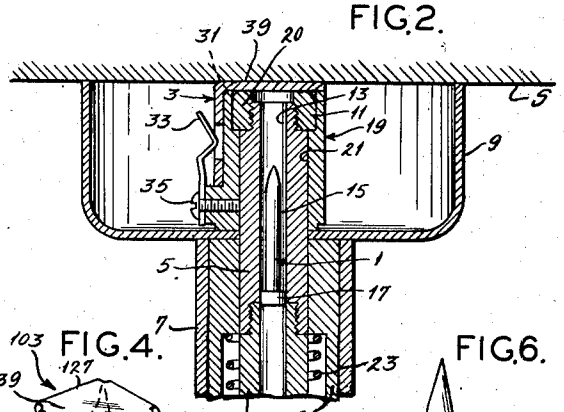


FIG. 3

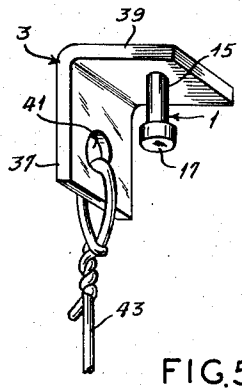


FIG. 4.

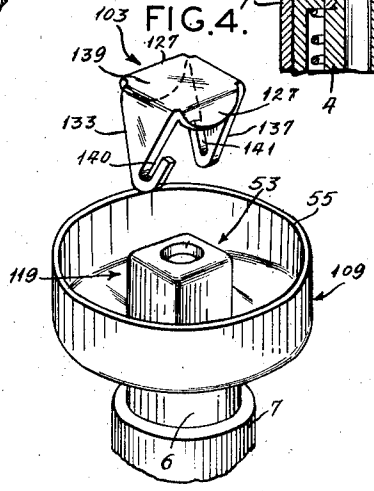


FIG. 6.

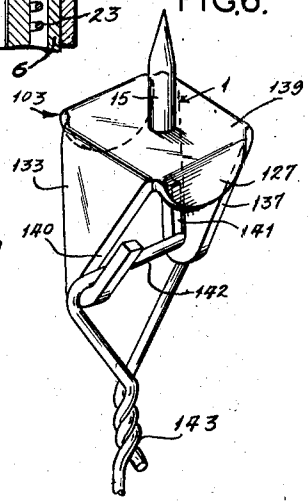


FIG. 5.

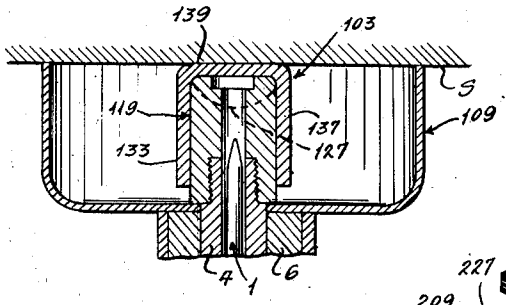


FIG. 7.

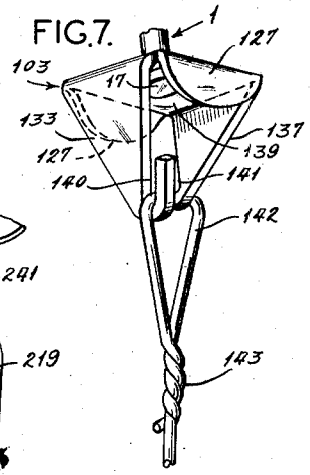


FIG. 8.

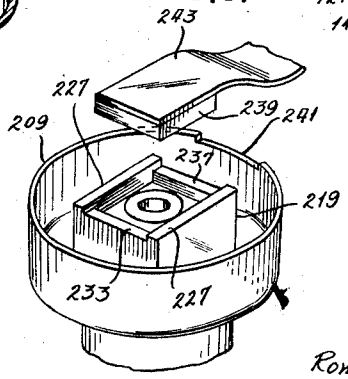
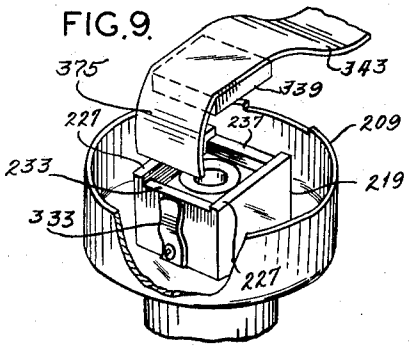


FIG. 9.



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United States Patent Office

2,863,149

Patented Dec. 9, 1958

2,863,149

APPARATUS FOR SECURING HANGERS WITH EXPLOSIVELY-ACTUATED TOOLS

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Application April 18, 1955, Serial No. 502,068

1 Claim. (Cl. 1—44.5)

This invention relates broadly to apparatus used in suspending hangers on an overhead supporting structure, and more particularly, to apparatus whereby hangers are secured with fasteners driven by a powder-actuated tool.

The hangers of a suspended ceiling often are attached to brackets, which are fastened to the overhead supporting structure. The job of fastening the brackets is an arduous one, however, even when the bracket fasteners are driven with explosively-actuated tools. If the brackets are attached to previously driven fasteners, there is the problem of assuring uniform placement with respect to the plane or surface of the structure, it being noted that the penetration of fasteners may vary. On the other hand, it is not convenient to hold a bracket manually while the fastener is driven therethrough, especially if the bracket is small.

Accordingly, it is an object of the invention to provide a simplified, more convenient system of fastening hangers to a supporting structure by means of fasteners driven with an explosively-actuated tool. Among the more specific objects of the invention may be noted the provision of apparatus whereby a hanger bracket is conveniently affixed to the tool and the tool is then brought to bear against the hanger-supporting structure; the provision of apparatus whereby the bracket is releasably held by the tool against the supporting structure while the fastener is driven without danger to the operator; and the provision of small economical brackets cooperable with tools in the manner set forth.

Briefly, the invention involves the use of a small hanger bracket, which is carried by the tool at the muzzle of the barrel. In each embodiment, the bracket is formed with a relatively closed rectangular base that has an aligning cooperation with a barrel fixture so as to extend across and at least partly obstruct the bore. In one embodiment, a hanger-attaching leg extends from the base along one side of the barrel fixture and is resiliently held by a finger on the fixture. Preferably, the base of the bracket is closed and is of thickness and composition such as to develop a tight frictional grip about the shank of a steel fastener driven therethrough. For example, the bracket may be formed as an angle member of 12 gauge (.1046 inch) thick steel, the leg and base being an inch long and three-quarters of an inch in width. The leg of the bracket is formed with an opening for subsequent attachment of hanger wire or strip, or if desired, the hanger may be pre-attached, as by spot welding. This bracket is used with a tool having a bracket-holding fixture. The fixture may be supplied as an accessory for a conventional tool, the fixture being secured to the barrel

and having a resilient finger for releasably holding the bracket at its leg.

In an alternative embodiment of the invention, the bracket is formed with resilient legs extending generally parallel to one another from opposite ends of the base, the legs having a releasable gripping cooperation with the barrel fixture, in which event, the fixture need not have a resilient finger. The fixture may have lips cooperable with the sides of the base, or the base may have lips cooperable with the sides of the fixture. Also, when two legs are provided, they may be shaped as hooks which open in opposite directions, the arrangement being one wherein the hooks are closed when the legs are drawn together after application of a hanger wire looped through the hooks.

In a further embodiment of the invention, the bracket may be a rectangular plate-like base, which is held in the barrel fixture, a hanger strap being secured to the plate or held over the plate by the fixture.

Other features of the invention will be in part apparent from and in part pointed out in the following detail description taken in connection with the accompanying drawings, in which:

Fig. 1 is an exploded view of certain apparatus embodying the invention;

Fig. 2 is a vertical section illustrating the manner of using the Fig. 1 apparatus;

Fig. 3 is an oblique view of the Fig. 1 bracket with a hanger attached thereto;

Fig. 4 is an exploded view showing an alternative embodiment of the invention;

Fig. 5 is a vertical section showing the Fig. 4 embodiment in use;

Fig. 6 is an oblique view of the Fig. 4 bracket, but illustrating a preliminary step in attaching a hanger;

Fig. 7 is a view similar to that of Fig. 6 with the hanger attached;

Fig. 8 is an exploded view illustrating another embodiment of the invention; and

Fig. 9 is a view similar to that of Fig. 8, but showing a modification thereof.

Interior ceilings are often suspended on hangers, which are attached to an overhead supporting structure, such as concrete slab, steel or wood joists, or a pre-existing ceiling. The hangers may be metal strips or wires, and they are usually affixed to the supporting structure by means of brackets. The task of securing the brackets is not an easy one, however, unless a powder-actuated tool is utilized. The supporting structure frequently is difficult to penetrate, and the work is carried out at an inconvenient height and in awkward positions. In using a powder-actuated tool, these difficulties are largely overcome, but other problems arise.

Referring now to Figs. 1–3 of the drawings, there is shown a powder-actuated tool with which a penetrating fastener 1 is driven to secure a bracket 3. The barrel 5 is shown mounted within a housing 7, between which and the barrel there is slidably mounted a shield tube 6 which in turn carries a muzzle shield 9. Although the shield preferably is carried in axially-movable relationship with respect to the muzzle 11 of the barrel, it may be affixed with respect to the end of the barrel. In use, the fastener 1 is breech loaded with a cartridge (not shown), and the tool is brought to bear against the work

surface S. The fastener is driven along the bore 13 with force sufficient to cause penetration of the work, and under normal conditions, the shank 15 of the fastener is firmly embedded. Variations in power and in the work material may cause the depth of penetration to vary, however, and the fastener can have a relatively enlarged head 17, in order to prevent over-penetration.

In one embodiment of the invention, the bracket is carried by means of bracket-holding fixture 19 at the muzzle. This fixture is a block formed with a bore 21 for admitting an extension 5 of the barrel 4. The fixture block is secured on the barrel, the extension 5 thereof projecting through the bore 21 of the block. Otherwise, the fixture block is secured between the muzzle shield 9 and muzzle cap 11, which is screwed onto the end of the barrel and which is in laterally overhanging relationship with respect to the barrel. The cup-like muzzle shield 9 is mounted on tube 6 received in telescoping relationship within the barrel housing 7. This tube 6 abuts against a spring 23, which imparts a forward bias to the muzzle shield. In mounting the fixture block, it is telescoped over the muzzle extension of the barrel within the shield, and the muzzle cap 11 is then threaded over the barrel to hold the block against forward displacement relative to the barrel. The forwardly biased muzzle shield engages the back of the fixture block so as to hold it against the muzzle cap.

The front of the block is counterbored at 25 so as to accommodate the muzzle cap 11, so that when the tool housing 7 is moved forwardly the barrel and shield normally remain together as a unit when the barrel is properly pressed against the work at right angles thereto. The barrel with respect to the shield may move forwardly independently of the shield if the barrel is at an angle to the work, in which event the tool should not be actuatable. This safety feature is more particularly described in the copending application Serial No. 355,034, filed May 14, 1953, for Explosively Actuated Tools, of which we are joint inventors with Robert W. Henning. Lips 27 projecting forwardly from opposite sides of the block serve to center the bracket, and one corner 29 is beveled to accommodate the corner of the bracket. The beveled side is flat at 31, and a resilient finger 33 extends forwardly thereacross from a mounting screw 35. This finger holds the bracket during initial manipulation of the tool into firing position, preferably in cooperation with a detent on the finger with a hole in the bracket.

The bracket 3 is formed with a leg 37 and a generally flat base 39 extending at right angles to the leg. The base 39 is closed, but if open, the opening should be smaller than the bore 13 of the barrel and preferably smaller than the shank 15 of the fastener. In other words, the relation should be one that provides for a tight frictional engagement between the fastener shank and the bracket base. The leg 37 is then formed with an opening 41 or equivalent means of attaching the hanger. In this first embodiment, the invention contemplates a simple bolt-nut connection through the opening 41 of the bracket with a conventional apertured metal strip, or a wire hanger 43 may be looped through the opening 41 (Fig. 3).

In operation, the tool is loaded and the bracket 3 is mounted on the fixture 19, the leg 37 being inserted beneath the resilient finger 33. The tool is then moved into proper position for securing the bracket against surface S. As pressure is applied to the tool, the muzzle cap 11 compresses the base 39 of the bracket against the work, and the shield 9 is held by spring 23 in surrounding protective relationship. It will be understood the forward projection of lips 27 and the periphery of the shield is limited relative to the thickness of the bracket. When the fastener 1 is driven through the base and into the work, the bracket becomes secured against the structure S. The hanger 43 is then applied after removal of the tool.

The head 17 of the fastener may not be driven down all the way, hence the base 39 of the bracket should be thick so as to develop a tight grip about the shank 15. In a commercial embodiment, the bracket is bent from twelve gauge (.1046 inch) steel, S. A. E. 1010–1020, without heat treatment. This bracket has a leg and base each one inch long and three-quarters of an inch wide, and it may be zinc plated to afford resistance against corrosion.

Referring now to Figs. 4–7, there is shown an alternative system utilizing a different type of bracket in combination with a conventional tool. In this instance, the bracket-holding fixture 119 combines the functions of the muzzle extension, cap and fixture previously described, the fixture 119 being threaded on the barrel 4, as shown in Figs. 4 and 5, so as to have a forwardly telescoping cooperation with the muzzle shield. The bracket 103 is formed with a pair of legs 133 and 137 projecting generally parallel to one another from opposite ends of the base 139. The legs of the bracket should be somewhat resilient and spaced so as to have a yieldable gripping cooperation with the periphery of the fixture 119 adjacent the muzzle, the muzzle shield 109 being deep enough to accommodate the legs. There is no need for a resilient finger. Also, the lips 27 previously referred to may be eliminated by forming lips 127 on the bracket. The lips 127 are bent over to project generally parallel to one another from the base 139 between the edges of the legs 133 and 137. The fixture is square so as to be cooperable with the legs and lips formed on the bracket, but otherwise the procedure of fastening the bracket is the same as that described above.

The method of attaching the hanger differs, however. In this embodiment, the legs 133 and 137 have hook-forming slots 140 and 141, respectively, which open in opposite directions. After the bracket is fastened, the loop 142 of a hanger 143 is inserted between the legs and rotated so as to enter both slots. The legs are then pressed together or they may be drawn together by tension on the hanger, with the result that the hooks become closed so as to prevent inadvertent detachment.

From the foregoing, it will be apparent that those skilled in the art will understand the structure, function and mode of operation, as well as appreciating the several advantages of this system. Although several embodiments have been disclosed in detail, it is to be understood that the drawings and description are illustrative of the principles, and that various modifications will present themselves to those experienced in this field.

For example, Fig. 8 discloses a system wherein a hanger strap 243 is secured at one end, as by spot welding, to a relatively thick plate 239 of rectangular outline. The strap 243 extends across one face of the plate, and the plate or base 239 otherwise is designed to seat within a fixture 219 on the tool. This fixture has a rectangular pocket defined by lips 227 for holding the plate 239 against lateral displacement. The plate is embraced at its other sides by walls 233 and 237, which are set back slightly to accommodate the strap 243. The strap extends out over the muzzle shield 209 through a recess 241. In Fig. 9, the strap 343 and plate 339 need not be secured, but an end 375 of the strap is caught in a clip 333, such as shown in Fig. 1. In both cases, the hanger strap is thin and flexible, whereas the plate is relatively thick and strong so as to provide a tight connection with a fastener driven therethrough, the strap being held between the plate and overlying supporting structure.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

In a powder-actuated tool for securing a supporting bracket by a penetrating fastener; the improvement comprising a barrel, a barrel housing surrounding said barrel, a muzzle shield slidably mounted on the barrel to extend outwardly therefrom ahead of said housing and biased forwardly thereof, a muzzle cap threaded over the muzzle of said barrel in laterally over-hanging relationship with

the muzzle of the barrel, and a bracket-holding fixture block formed with a bore, said fixture block being in surrounding relationship with the muzzle end of the barrel and being held against the muzzle cap by the forwardly-biased muzzle shield, an opening being formed in the forward end of said fixture block to accommodate said muzzle cap, and the said fixture block being configurated with respect to at least one of its faces to releasably hold said bracket ahead of said muzzle in centered relationship with respect to the bore of the barrel.

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