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3,266,459

CHEMICAL COMPOUND APPLICATOR FOR THREADED FASTENERS

Filed June 20, 1963

2 Sheets-Sheet 1

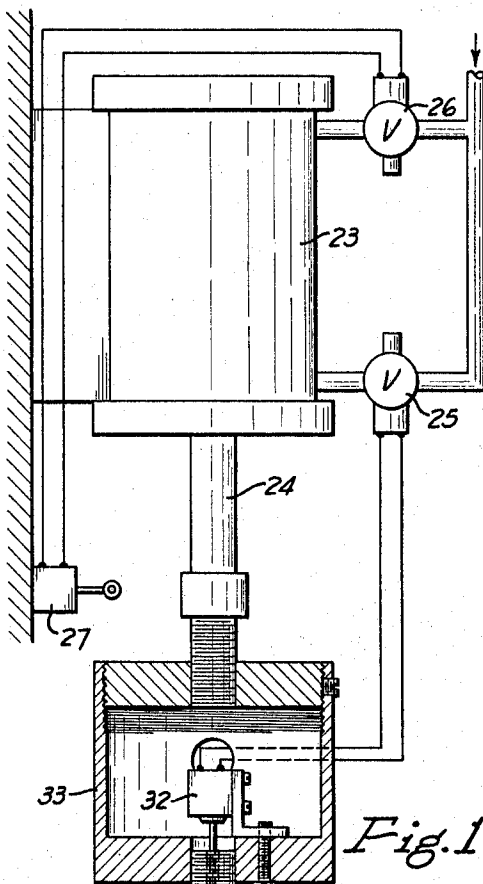


Fig. 1

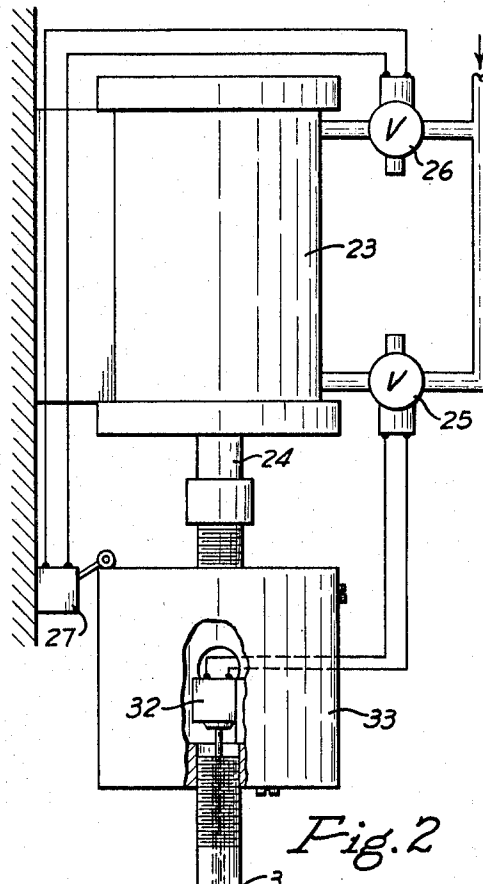
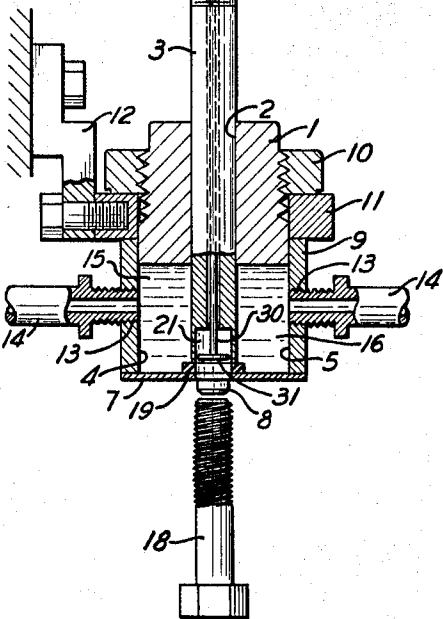
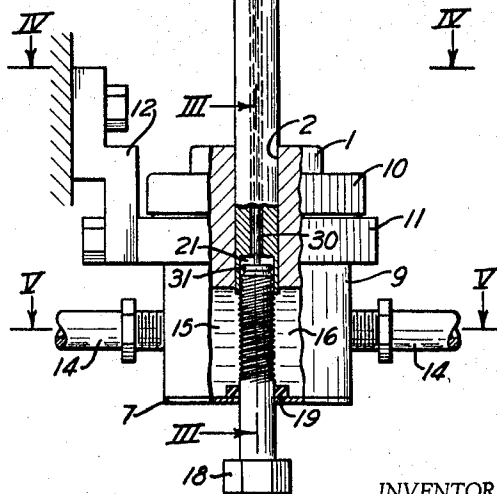


Fig. 2



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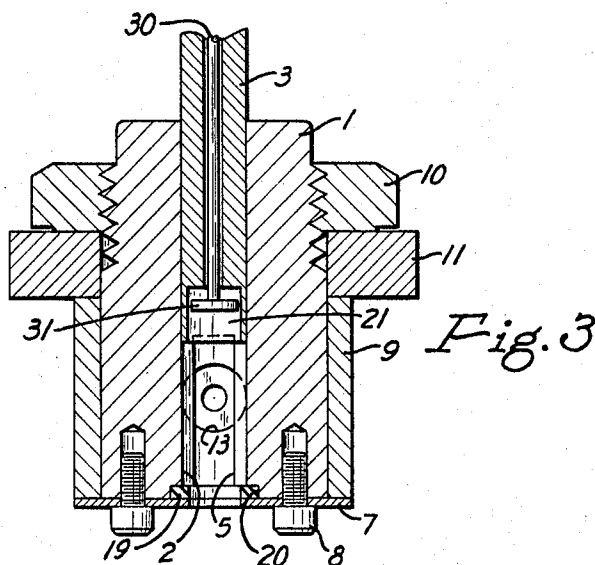
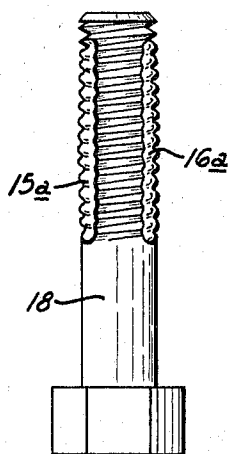
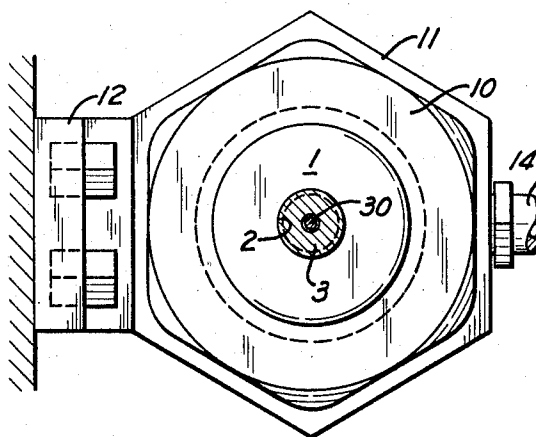
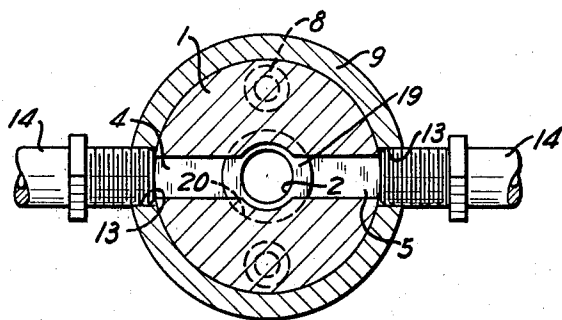


Fig. 5

Fig. 4

Fig. 6

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CHEMICAL COMPOUND APPLICATOR FOR
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8 Claims. (Cl. 118—1)

This invention relates to applicators for applying circumferentially spaced bands of chemical compounds along the shanks of threaded fasteners, such as screws and bolts.

In my Patent Number 3,061,455 a self-locking bolt is shown that is provided with spaced areas of chemical compounds which, when mixed together, will react and lock the nut and its encircling nut together. This type of bolt is well known and widely used, a preferred form being one in which two bands of chemical compounds extend lengthwise along the shank of the bolt in circumferentially spaced areas, such as indicated in FIG. 2 of the patent. The chemical compounds that are used are capable of polymerizing or copolymerizing when brought together, such as rubber compounds or epoxy resins, all as explained in the patent. The particular compounds used form no part of the present invention, which is directed solely to apparatus for applying the compounds to the fasteners.

It therefore is among the objects of this invention to provide means by which reactive compounds can be applied to the threaded shank of a fastener rapidly, inexpensively and easily.

In accordance with this invention a housing is provided with a straight passage through it having a rear end and a front end. Slidably mounted in this passage is a piston that projects from its rear end. Means are connected with the rear end of the piston to position its front end in the front end of the passage to close it. The housing is provided at opposite sides of the passage adjacent the front end thereof with chambers extending along the passage and opening into it. The inner sides of the chambers are spaced apart and normally are closed by the piston. The housing has an inlet port for each chamber, and means are provided for delivering a different chemical compound to each port under pressure to maintain the chambers full of those compounds. The piston is movable rearwardly when its front end is engaged by a fastener shank in line with it and having a diameter no greater than the diameter of the piston. Consequently the fastener can enter the passage to receive coatings of the chemical compounds in two spaced bands extending lengthwise of the fastener. When the piston is moved forward again, the coated fastener is ejected from the passage.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a side view of my applicator, mostly in vertical section;

FIG. 2 is a similar view, showing a bolt being coated;

FIG. 3 is an enlarged vertical section through the coating housing taken on the line III—III of FIG. 2 but with the bolt absent;

FIG. 4 is an enlarged horizontal section taken on the line IV—IV of FIG. 2;

FIG. 5 is an enlarged horizontal section taken on the line V—V of FIG. 2, with the bolt removed; and

FIG. 6 is an enlarged side view of a bolt coated by my applicator.

Referring to the drawings, the applicator housing includes a metal block 1, usually cylindrical, that is provided with an axial passage 2 extending through it from end to end. This passage has a diameter great enough to receive the threaded fasteners that are to be coated, preferably with a slight clearance around them. Although the block can be used on its sides, it is more satisfactory in

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an upright position as shown. Slidably mounted in the block passage is a piston 3 that is in the form of a rod long enough to extend entirely through the block and project from its rear or upper end. Assuming that only two chemical compounds are to be applied with this device, the lower part of the block is provided at opposite sides of its central passage with a pair of vertical chambers 4 and 5, preferably extending upwardly from the lower or front face of the block. The inner sides of the chambers open into the central passage, while their outer sides are open at the periphery of the block. When the piston is in its lower position as shown in FIG. 1, with its front end closing the front or lower end of the passage, the inner sides of the two chambers are spaced apart by the piston and normally are closed by it.

To close the bottoms of the block chambers, a circular bottom plate 7 is fastened by screws 8 to the bottom of the block. This plate projects radially from the block and forms a retaining member which supports a sleeve 9 that snugly encircles the block and extends a short distance up above the top of the chambers. The sleeve closes the outer sides of the chambers. It is held down tightly against the bottom plate by means of a nut 10 screwed on the threaded upper end of the block and preferably pressing a yoke 11 down against the sleeve. The nut, yoke and bottom plate also form parts of the applicator housing. The yoke is supported by a bracket 12 that is attached to a suitable support for supporting the housing. The sleeve is provided at the outer side of each chamber with an inlet port 13, in which a tube 14 is screwed, the opposite end of the tube being connected to suitable means (not shown) for delivering a plastic chemical compound 15 or 16 to the adjoining chamber under constant pressure. When the piston is in its lower position it prevents the compounds in the two chambers from mixing.

The applicator may be used by aligning a screw or bolt 18 with the lower end of the lowered piston as shown in FIG. 1, and then simply raising the threaded end of the bolt to push the piston upwardly in passage 2 so that the threaded shank of the bolt takes the place of the piston between the two chambers as shown in FIG. 2. The opposite sides of the bolt therefore are exposed directly to the chemical compounds in the two chambers, and the pressure behind the compounds forces them forward between the screw threads so that when the bolt is removed from the housing its threaded shank is provided with a pair of circumferentially spaced bands 15a and 16a of the chemical compounds extending lengthwise along it, as shown in FIG. 6. The bolt is not left in the housing long enough for the viscous compounds to flow laterally around it and meet. As the bolt is removed, the piston is lowered with it to keep the two compounds apart. Excess plastic may be wiped from the bolt as it is withdrawn from the housing, by means of a resilient wiping ring 19 mounted in a recess 20 (FIGS. 3 and 5) in the bottom of block 1 around the lower end of the central passage. The ring is supported by the bottom plate and snugly engages the bolt. The chemical compounds can be kept away from the end threads of the bolt, so that a nut can be started on the bolt more easily, by providing the front end of the piston with a large recess 21 that receives the end portion of the bolt and thereby covers its threads. This recess also centers the bolt in passage 2.

For easier operation of the applicator and best results it is desirable that the piston be raised in the housing passage, not by the pressure of the bolt against it, but by power means connected with the upper end of the piston. As shown in FIGS. 1 and 2, such means may include a double acting air cylinder 23 rigidly mounted above piston 3 and containing a piston of its own which has a downwardly extending piston rod 24 suitably connected to the upper end of the piston below it. Air

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under pressure can be admitted and exhausted from the opposite ends of the cylinder by means of electric valves 25 and 26, the lower one of which is opened to air pressure automatically or by a suitable manual operation when the bolt is engaged with the lower end of the piston. At the same time, the upper valve exhausts to atmosphere. The piston then is slowly raised or retracted in the housing by piston rod 24 as the operator maintains the bolt in contact with its lower end. When the piston has risen to the desired height, as shown in FIG. 2, it may trip a limit switch 27 that controls the upper valve 26 to admit air pressure to the upper end of the cylinder to push the piston back down again, while the lower valve connects the lower end of the cylinder with the atmosphere.

Preferably, piston 3 is provided with an axial bore in which a small rod 30 is slidably mounted. The upper end of this rod projects above the piston and the lower end carries a head 31 in recess 21. When a bolt is inserted in this recess while the piston is in its lower position, the head and rod are moved up in the piston so that the upper end of the rod will close an electric switch 32 rigidly mounted inside of a switch housing 33 screwed onto the upper end of the piston. This housing is supported by piston rod 24 from the cylinder above it. The switch is connected with the lower valve to cause it to admit air pressure to the lower end of the cylinder, whereby the simple step of inserting the bolt in recess 21 sets the applicator in operation.

I claim:

1. An applicator for applying a pair of circumferentially spaced bands of chemical compounds lengthwise along the shank of a fastener, said applicator comprising a housing provided with a straight passage therethrough having a rear end and a front end, a piston slidably mounted in the passage and projecting from said rear end, means operatively connected with the rear end of the piston for normally positioning its front end in the front end of the passage to close it, the housing being provided at opposite sides of said passage adjacent the front end of the passage with chambers extending along the passage and opening into it, the inner sides of said chambers being spaced apart and normally being closed by the piston, the housing having an inlet port for each chamber, and means for delivering a different chemical compound to each port under pressure to maintain said chambers full of the compounds, the piston being movable rearwardly when its front end is engaged by an axially aligned fastener shank having a diameter no greater than the diameter of the piston, whereby the fastener can enter said passage to receive coatings of said compounds in two spaced bands extending lengthwise of the fastener.

2. An applicator according to claim 1, including a re-

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silient wiping ring mounted in the front end of said passage and having an inner diameter slightly smaller than the diameter of the passage.

3. An applicator according to claim 1, in which the front end of said piston is provided with a large recess adapted to receive the tip of the shank of a fastener.

4. An applicator according to claim 1, in which said housing includes a block provided with said passage and chambers, and a sleeve surrounding said block and closing the outer sides of the chambers, the sleeve being provided with said inlet ports.

5. An applicator according to claim 4, including a retaining member secured to the front end of said block and engaged by the front end of said sleeve, the block having an externally threaded portion projecting from the rear end of the sleeve, and a nut screwed onto said threaded portion for pressing the sleeve against said retaining member.

6. An applicator according to claim 1, including fluid operated pressure means operatively connected with the piston, a normally closed valve controlling delivery of pressure fluid to said fluid pressure operated means to retract the piston, and means for opening said valve when the tip of a fastener is brought into engagement with the front end of the piston.

7. An applicator according to claim 6, including a normally closed electrically operated valve controlling delivery of pressure fluid to said fluid pressure operated means to return said piston from its retracted position, an electric limit switch connected with said last-mentioned valve, and means movable rearwardly with the piston for operating said switch.

8. An applicator according to claim 1, in which said piston is provided with an axial bore therethrough and with a large recess in its front end, said applicator including a push rod slidably mounted in said bore and projecting from the opposite ends thereof, a head on the end of said rod in said recess, fluid pressure operated means operatively connected with the piston, a normally closed electrically operated valve controlling delivery of pressure fluid to said fluid pressure operated means to retract the piston, and an electric switch connected with said valve for opening it and operated by the rear end of the rod when the rod is pushed rearwardly by the tip of a fastener inserted in said piston recess and pushed against said head.

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