

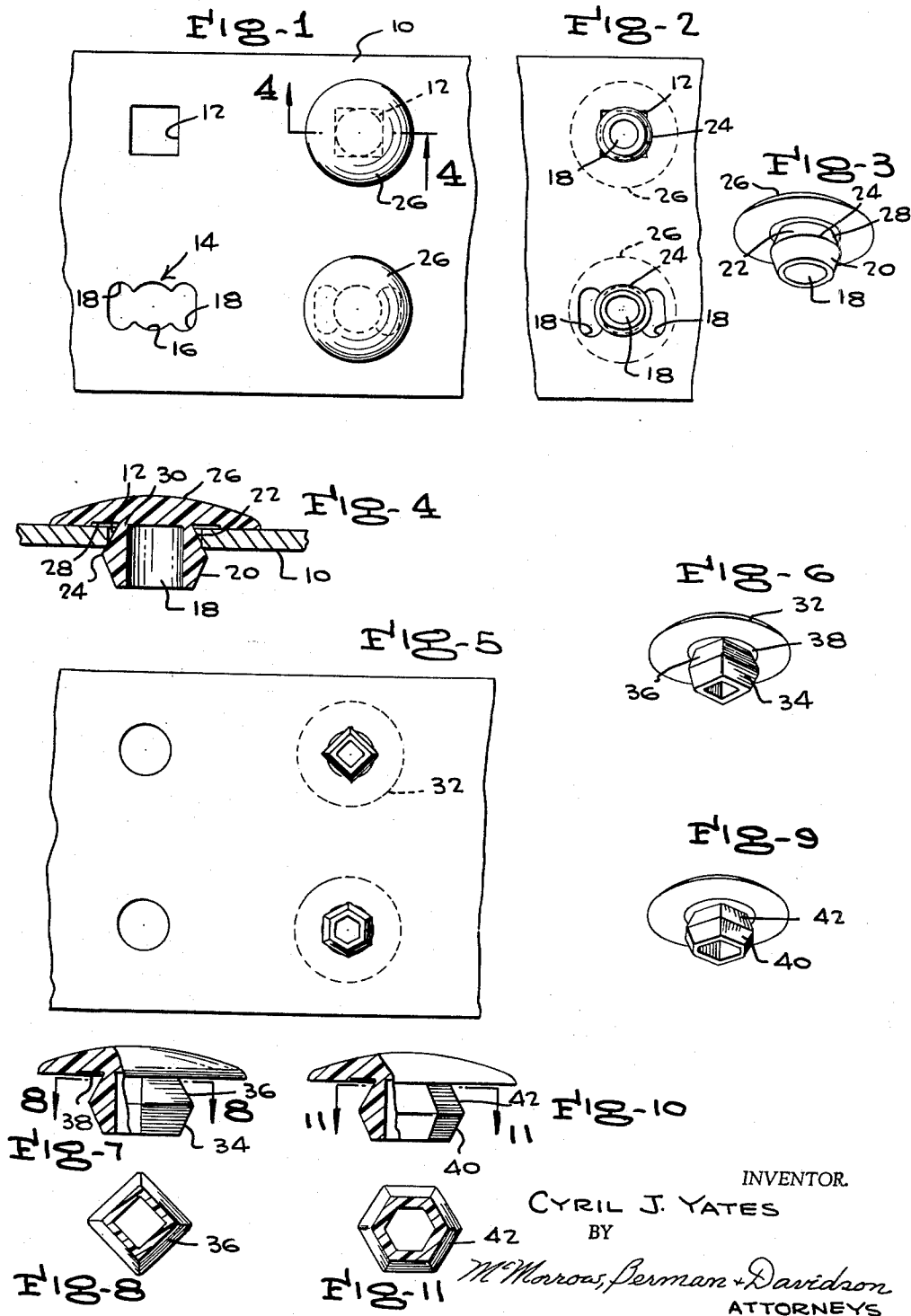
Feb. 9, 1965

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3,168,961

HOLE PLUG

Filed Feb. 16, 1962



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3,168,961 HOLE PLUG

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Filed Feb. 16, 1962, Ser. No. 173,673
4 Claims. (Cl. 220—60)

This invention relates to plugs for closing openings in sheet metal or the like, and in particular to plugs of the quick-action type, which are insertable by simple, digital pressure, and self-locking. In the refrigerator art, for instance, it is common to provide the appliances with wall openings for selective use, as in suspending shelves, and for other purposes. For such openings which are not actually employed in functional use, it becomes desirable, if not necessary, to provide a closure, as well understood in the art, and various types of such closures, or plugs, have been provided heretofore. Obviously the plugs should be minimal in size and unobtrusive in appearance, while possessed of a capability for ready insertion and tenacious holding, and it is among the objects of the present invention to accomplish those ends.

Since the requirement for plugs of this type involves large quantities, it also becomes important to produce them economically, and it is therefore a further object to provide a plug which is simple of manufacture and low in cost.

The openings requiring these plugs are predominantly of two general types, one square, and the other an oblong hole with scalloped borders, known as a "butterfly" hole, and it is a further object to provide a plug having a favorable mode of co-action with openings of this nature, as well as modified forms which are adapted to circular holes.

Yet another object is to provide a plug structure which combines a self-locking feature with effective peripheral sealing.

These and other objects, which will be apparent, are attained by the present invention, preferred forms of which are described in the specification hereinafter, as illustrated in the drawing, in which:

FIGURE 1 is a plan view of a plate having two types of non-circular openings, with two plugs in place, one in each type of opening,

FIGURE 2 is a view similar to FIGURE 1, showing the opposite side of the plate, in the region of the two plugs,

FIGURE 3 is a perspective view of one of the plugs shown in FIGURES 1 and 2,

FIGURE 4 is an axial sectional view through one of the plugs, taken on the line 4—4 of FIGURE 1,

FIGURE 5 is a view similar to FIGURE 2, showing a plate with circular holes, and two modified forms of plugs,

FIGURE 6 is a perspective view of the uppermost plug in FIGURE 5,

FIGURE 7 is an elevational view of the plug of FIGURE 6, in partial, radial section,

FIGURE 8 is a sectional view taken on the line 8—8 of FIGURE 7,

FIGURE 9 is a perspective view of the lowermost plug of FIGURE 5,

FIGURE 10 is an elevational view of the plug of FIGURE 9, in partial, radial section, and

FIGURE 11 is a sectional view, taken on the line 11—11 of FIGURE 10.

Referring to the drawing by characters of reference, there is shown, in FIGURE 1, a section of steel plate, 10, which may be considered as representing a wall or partition in an appliance, such as a refrigerator, and which is provided with square openings 12, and "butterfly" openings 14, the latter representing a combination of a central, circular opening 16, with two generally elliptical openings 18 at the ends. The function and purpose of these particular shapes of openings is immaterial in respect to the

present invention, the only purpose of which is to provide a device to seal them off.

As best seen in FIGURES 3 and 4, the closure plug of the invention, in a preferred form, comprises a tubular shank portion having a cylindrical, central passage 18, with the outer surface of the surrounding wall section having the form of a pair of similar cone frustums 20, 22, arranged base-to-base, and meeting in a common, peripheral line 24, which may be described as an annular vertex. Both the slant sides and the vertex are important features of the invention, as will be seen.

Integral with the shank, at one end thereof, is a concentrically arranged, frusto-spherical head 26, of relatively shallow depth, and of substantially greater diameter than the maximum diameter of the shank. On its under side, the head 26 is provided with an annular channel 28, extending radially from the shank to a point about half the distance to the outer periphery of the head.

In the application of the plug to the square holes 12, the doubly conical shank has a favorable mode of co-action. The plugs are made from a tough, resilient, plastic material, such as nylon or polyethylene for example, and the shank is appropriately sized so that its maximum diameter exceeds the side dimension of the square opening for which it is intended. As the plug shank is inserted in the hole, using thumb pressure, the outer, tapering section of the shank is forced inwardly by central portions of the four sides of the square opening, the shank being deformed into four flat portions, compensated by a corresponding movement into the region of the four corners of the square. After the line of maximum diameter 24 has passed through the opening, the shank recovers its natural shape, due to its resilience, and the wide portion of the shank engages the inner corner of the hole, and locks the plug in place.

In the act of penetration, the channel 28 in the under side of the plug head permits contact of the flat, outer zone of the under side of the head with the surface of plate 10, prior to full locking engagement of the shank, and this guarantees an effective seal throughout, in spite of any slight warping in the head, or irregularities in the surface of plate 10. The cylindrical cavity 18 also contributes to this result, since it limits the integral connection of shank to head to a narrow annular zone 30, and permits flexibility in the head which is more or less independent of the shank; that is to say, any recovery action in the deformed head results in a straight axial pull on the shank, rather than a twisting action.

In the case of plugs for round holes, the concept of the invention is applied in a complementary sense, the plug in this case having a shank with polygonal periphery which deforms toward circular form, for compensation, when negotiating the circular hole. Thus, in FIGURE 6 the plug has a domed head 32 the same as head 26, in the FIGURE 1 form, but the shank comprises base-joined frustums 35, 36 of four-sided pyramids instead of cones. The channel 38 on the under side of the head is similar to channel 28 in FIGURES 3 and 4, except for having a square, inner periphery, comporting with the square section of the shank. Thus, except for the cross sectional form of the shank, the plug is generally similar to that shown in FIGURES 1 to 4, and the action is not sensibly different since it depends on the co-action between a hole and a shank having different peripheral shapes.

The plug of FIGURES 9—11 differs from that of FIGURES 6—8 only in the shank, which has six-sided pyramidal frustums 40, 42, instead of four-sided frustums.

There has thus been provided a plug which, among other things, is easily applied to a hole, and will hold firmly in place, especially in the case of holes which may vary in size, due for instance to a build-up of porcelain

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during coating of the steel sheet. Of the existing plugs intended to cope with these problems, most are either limited to close tolerances, or involve split shanks, which require expensive and cumbersome tooling in their manufacture.

Generally speaking, whereas certain preferred embodiments have been shown and described, other modifications will be apparent in the light of this disclosure, and the invention should not, therefore, be deemed as limited, except insofar as shall appear from the spirit and scope of the appended claims.

I claim:

1. A closure plug of plastic material, for openings in sheet members, comprising a circular, domed head, with a planar, annular, peripheral zone on its under side, and an axially disposed, tubular shank extending from said under side, said shank having a bulbous, outer form, defined by a pair of substantially identical, frusto-pyramidal, surfaces arranged in base-to-base coincidence, said head having an annular channel in its said under side, extending from said shank to said annular zone.

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2. A device as in claim 1, said surfaces being frusto-conical.

3. A device as in claim 1, said shank being polygonal in cross section.

4. A device as in claim 1, the diameter of said head being in excess of the diagonal of a square, circumscribing the major cross section of said shank.

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