

WASHER AND FASTENING ASSEMBLY

This invention pertains to an improved washer useful with a fastener, such as a screw or a drive pin, to fasten a compressible slab of insulation and a covering mesh to a wall or ceiling substrate. This invention pertains, moreover, to a fastening assembly combining such a fastener with the improved washer.

In fastening a compressible slab of insulation or other material to a wall or ceiling substrate before a polymer, stucco, plaster, or other finish is applied over such insulation or other material, particularly but not exclusively in an exterior application, it is known to use a fastener having a head and a shank, such as a screw, nail, or drive pin, and a washer having a socket to contain the head of the fastener. Typically, the washer is moulded from a polymeric material, such as polyethylene or polypropylene.

Moreover, it is known to cover the head of the fastener with a cover, which is pressed into the washer socket containing the fastener head. The cover may be also moulded from the polymeric material used to mould the washer. The cover creates a thermal break between the fastener and the stucco, plaster, or other finish.

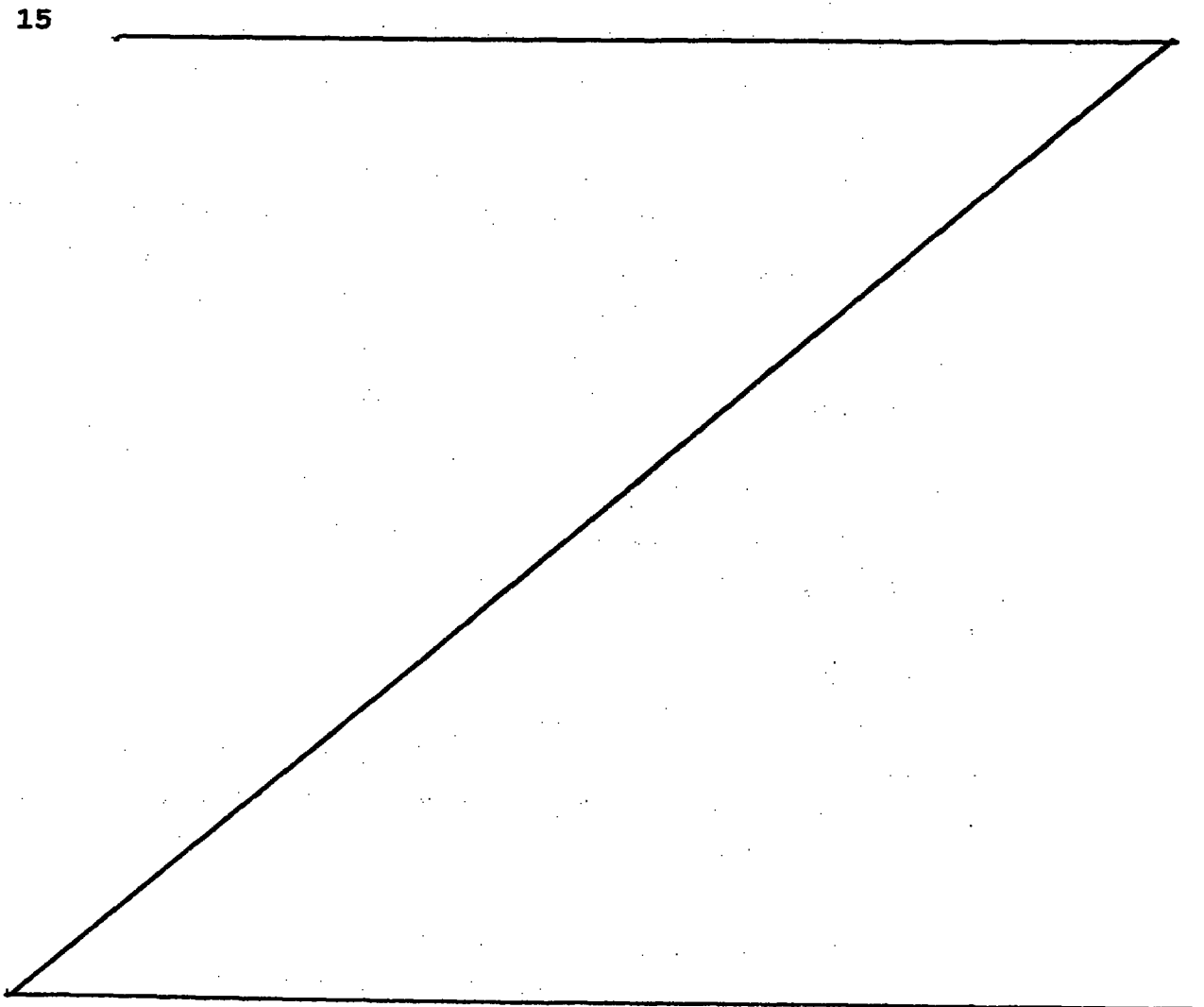
There has been a need, to which this invention is addressed, for improvements in such a washer.

According to this invention a washer is moulded from a flexible, polymeric material, the washer having a socket having an end wall with an aperture, the aperture being configured to permit the shank to extend through the aperture but not to permit the head to pass through the aperture, the socket being configured to contain the head with the shank extending through the aperture, the washer having an integral flap made from the material of the washer and hinged along a hinge made from the material of the flap, the socket having lateral walls including a lateral wall defining a locking formation spaced from the end wall, the flap being adapted to be snap-fitted under

the locking formation, the flap being configured to substantially cover the head, as contained by the socket with the shank extending through the aperture, and to be disposed substantially within the socket when the flap is snap-fitted under the locking formation.

Polypropylene is a preferred material for the washer. Polyethylene is an alternate material for the washer.

Preferably, the locking formation comprises a curved lip extending from lateral wall portions of the socket, and the flap has a curved edge adapted to fit under the curved lip when the flap is snap-fitted thereunder. Also, it is preferred that the flap is joined integrally to other portions of the washer near one of the lateral walls of the socket, in opposed relation to the locking formation.



When a resilient polymeric material, such as polypropylene, is used for the washer including the flap, it is preferred that the washer has an unstressed shape, in which the flap extends outwardly in relation to the socket. Thus, when the flap is snap-fitted under the locking formation, the flap is stressed so as to be inherently biased against the locking formation.

As an additional feature, the washer may have a recess adjacent the flap to facilitate prying the flap from under the locking formation. The additional feature is useful if and when it is desired to remove a fastener, such as a screw, without damaging the washer.

Moreover, the washer provided by this invention may be advantageously combined with a fastener having a head and a shank, in a fastening assembly. In the fastening assembly, the fastener head is contained by the washer socket with the fastener shank extending through the aperture of the end wall portion of the washer socket. Moreover, the flap is snap-fitted under the locking formation.

Particular embodiments of washers and fasteners in accordance with this invention will now be described with reference to the accompanying drawings.

Figure 1 is a perspective view of a washer according to this invention, as combined with a screw in a fastening assembly.

Figure 2 is an elevational view of a drive pin, which in certain applications is substitutable for the screw in the fastening assembly shown in Figure 1.

Figure 3, on a larger scale, is a sectional view taken along line 3--3 of Figure 1, in a direction indicated by arrows, with the screw in a changed position.

Figure 4 is a sectional view similar to Figure 4 but taken with the screw in a further changed position and with a flap of the washer in a changed position.

5 Figure 5 is an enlarged, fragmentary detail of the washer, as shown in Figure 3, with the screw omitted.

Figure 6 is a further enlarged elevational view of the washer, as shown in Figure 4, with the screw omitted.

10 Figure 7 is a cross-sectional view showing the washer in its orientation of Figure 6 and the screw, as used to fasten a compressible body of exterior insulation and a covering mesh to a substrate.

15 As shown, a washer 10 constituting a preferred embodiment of this invention is useful with a fastener of a known type, such as a screw 12 shown in Figures 1, 3, 4, and 7, or a drive pin 14 shown in Figure 2. The washer 10 is useful with either fastener to fasten a
20 compressible body 16 of insulation and a mesh 18 covering the compressible body 16 to a substrate 20 before a finish 22 is applied over the compressible body 20 and over the covering mesh 18. As compared to known washers for similar uses, the washer 10 has enhanced
25 utility because the washer 10 not only creates a thermal break between the screw 12 and the finish 22, or between the drive pin 14 and the finish 22, but also locks the screw 12 or the drive pin 14 positively to the washer 10.

30 The compressible body 16 of insulation may be a compressible slab of expanded polystyrene or a compressible batt of semi-rigid fiberglass. As shown, the substrate 20 is a framework of wooden studs, with which the screw 12 is useful. The screw 12 would be
35 similarly useful if a substrate made of light gauge steel framework or sheet were used.

The covering mesh 18 may be a metallic mesh or a non-metallic mesh, such as nylon or fiberglass. The covering mesh 18 may be non-woven, as shown, or woven and may have large apertures, as shown, or small apertures. Suitable meshes are available commercially from various sources.

The screw 12 has a head 24, which has a cross-shaped slot 26 adapted to coact with a driving tip (not shown) of a manual or powered tool of a known type. Also, the screw 12 has a shank 28, which has an unthreaded portion 30 adjoining the head 24, a threaded portion 32 adjoining the unthreaded portion 30, and a self-drilling tip 34 adjoining the threaded portion 32. Suitable screws are available commercially from various sources, which include ITW-Buildex (a division of Illinois Tool Works Inc) of Itasca, Illinois.

Rather than the screw 12, the drive pin 14 could be instead used if a substrate made of heavy gauge steel or other heavy gauge metal, concrete block, or masonry were used. The drive pin 14, which is made of hardened steel, has a head 36 and a shank 38, which has a portion 40 of larger diameter adjoining the head 36, a portion 42 of smaller diameter adjoining the portion 40, and a pointed tip 44 adjoining the portion 42. The drive pin 14 is adapted to be rapidly driven by a pneumatically powered, combustion-powered, or other powered tool (not shown) of a known type. Suitable drive pins are available commercially from various sources. In concrete/masonry construction, other fasteners could be used, such as threaded fasteners or nail-type anchors received in pre-drilled holes.

As shown in Figure 7, the finish 22 is a stucco layer, which typically is made from a mixture of portland cement, sand, and a small percentage of lime. In present day practice, the exterior layer or finish 22 is more likely to be a polymer (acrylic) rather than

stucco. For some applications, particularly but not exclusively interior applications, a plaster layer or a painted finish may be alternatively used as the finish 22. Typically, the finish 22 is applied in a plastic or fluid state and is allowed to cure under ambient conditions.

The washer 10 is molded from polypropylene, which is a suitable material because it is flexible, resilient, and thermally insulative. It is typical for a polymeric material, such as polypropylene, to be thermally insulative. The washer 10, which defines an axis, has a central, generally frusto-conical portion 50. The central portion 50 defines a central socket 52 having an end wall 54 with an axial aperture 56. The aperture 56 is configured to permit the shank 28 of the screw 12 or the shank 38 of the drive pin 14 to pass through the aperture 56 but not to permit the head 24 of the screw 12 or the head 36 of the drive pin 14 to pass through the aperture 56. The socket 52 is adapted to contain the head 24 of the screw 12 with the shank 28 thereof extending through the aperture 56 or the to contain the head 36 of the drive pin 14 with the shank 38 thereof extending through the aperture 56.

The washer 10 has an annular skirt portion 60 which surrounds the central portion 50. The skirt portion 60 has a plurality of larger, triangular apertures 62 and a plurality of smaller, triangular apertures 64. The apertures 62 and the apertures 64 are alternated in a regular, annular pattern, as shown in Figures 1 and 6. The central portion 50 has a pair of arcuate grooves 66, 68, which are spaced radially inward from the apertures 62 and the apertures 64, and which are spaced radially outwardly from the socket 56.

Besides the end wall portion 54, the socket 52 has lateral walls, namely a back wall 70, two side wall portions 72, 74, and a front wall portion 76. The back

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5 wall 70 and the side walls 72, 74, are generally planar and meet at right angles. The front wall portion 76 is generally semi-cylindrical and merges with the surfaces 72, 74, except for a locking formation 78. The locking formation 78 is defined by a curved lip 80, which extends from the front wall 76, toward the back wall portion 70, in axially spaced relation to the end wall 54.

10 The washer 10 has an integral flap 90, which is hinged along a hinge 92 formed from the material of the flap 90. Such a hinge may be conveniently called a "living" hinge, in common parlance. The flap 90 is joined integrally to the central portion 50, via the hinge 92, near the back wall 70 of the socket 52. The
15 hinge 92 is defined by a notch 94 extending across the flap 90 and dividing the flap 90 into a base part 96 and a distal part 98. A groove 100 in the central portion 50 divides the flap 90 from adjacent parts of the central portion 50. The distal part 96 of the flap 90
20 has a curved edge 106, which conforms generally to the front wall portion 76 of the socket 52, below the curved lip 80. As shown in Figure 3, the washer 10 has an unstressed shape, in which the flap 90 extends outwardly in relation to the socket 52.

25 The flap 90 is adapted to be snap-fitted, at the curved edge 106, under the curved lip 80. The curved edge 106 is adapted to fit under the curved lip 80 when the flap 90 is snap-fitted thereunder. It is noted again that the material of the washer 10 including
30 the flap 90 is resilient. Thus, when the flap 90 is snap-fitted under the curved lip 80, the flap 90 is stressed so as to be inherently biased against the curved lip 80. The flap 90 is configured to substantially cover the fastener head, as contained by
35 the socket 52 with the fastener shank extending through

the aperture 56, when the flap 90 is snap-fitted under the curved lip 80.

As shown in Figure 6, the washer 10 is provided with recesses 110, 112, adjacent the flap 90, each extending along one of the sides of the socket 52. The recesses 110, 112, are continuations of the groove 100. Each such recess adjacent the flap 90 facilitates prying the flap 90 from under the curved lip 80, via a flat blade (not shown) of a screwdriver or another prying tool, if and when it is desired to remove a fastener, such as the screw 12, without damaging the washer 10. However, each such recess is sufficiently small to minimize infiltration of the finish 22 therethrough, into the socket 52.

As shown in Figure 7, the washer 10 and the screw 12 are combined in a fastening assembly, which is useful to fasten the compressible body 16 of insulation and the covering mesh 18 to the substrate 20 before the finish 22 is applied. Initially, the washer 10 is positioned against the covering mesh 18 with the flap 18 unstressed, as shown in Figure 3. Thereupon, the screw 12 is positioned with the screw shank 28 extending through the aperture 56 and bearing against the covering mesh 18, or with the screw 12 extending through the aperture 56 and through an aperture of the covering mesh 18. After the screw 12 has been driven in such manner that the compressible body 16 is compressed locally where pressed by the washer 10 with the screw head 24 contained by the socket 52, the flap 90 is snap-fitted under the curved lip 80 with the curved edge 106 fitted under the curved lip 80. Next, the finish 22 is applied over the washer 10, as well as over exposed areas of the compressible body 16 and over exposed areas of the covering mesh 18. The finish 22 penetrates the apertures 62, 64, the grooves 66, 68, the groove 100, and the recesses 110, 112, and penetrates some of the

apertures of the covering mesh 18, so as to become interlocked with the washer 10 and the covering mesh 18 as the finish 22 cures.

5 Because the flap 90 substantially covers the screw head 24 contained by the socket 52 when the flap 90 is snap-fitted under the curved lip 80, the flap 90 prevents infiltration of any substantial amount of the finish 22 into the socket 52. Thus, the flap 90 creates a thermal break between the screw head 24 and the finish 10 22. The thermal break is defined by the flap 90, which is thermally insulative because of the material of the washer 10 including the flap 90, and by air space between the flap 90 and the screw head 24.

15 When the flap 90 is snap-fitted under the curved lip 80, the flap 90 retains the screw head 24 within the washer 10. Thus, if external forces are applied accidentally to the finish 22 (as suggested by broad arrows in Figures 7) in such manner that the screw head 24 bears against the flap 90 (as indicated by an 20 illustration of the screw head 24 in phantom lines in Figure 7) and would tend to break through the finish 22 but for the flap 90, the flap 90 distributes reactive forces from the screw head 24 across other parts of the washer 10, via the curved lip 80, so as to resist 25 tendencies of the screw head 24 to break through the finish 22.

Similarly, the washer 10 is useful with the screw 12 or the drive pin 14 to fasten the compressible body 16 of insulation to the substrate 20 without the 30 covering mesh 18, or before the covering mesh 18 is applied. A first group of such washers and such screws or drive pins may be initially used, at selected locations on the substrate 20, to fasten the compressible body 16 to the substrate 20 without the 35 covering mesh 18. A second group of such washers and such screws or drive pins may be subsequently used, at

different locations on the substrate 20, to fasten the covering mesh 18 over the compressible body 16 and to fasten the compressible body 16 to the substrate 20.

CLAIMS

1. A washer useful with a fastener having a head and a shank, such as a screw or a drive pin, the washer being
5 moulded from a flexible, polymeric material, the washer having a socket having an end wall with an aperture, the aperture being configured to permit the shank to extend through the aperture but not to permit the head to pass through the aperture, the socket being configured to
10 contain the head with the shank extending through the aperture, the washer having an integral flap made from the material of the washer and hinged along a hinge made from the material of the flap, the socket having lateral walls including a lateral wall defining a locking formation
15 spaced from the end wall, the flap being adapted to be snap fitted under the locking formation, the flap being configured to substantially cover the head, as contained by the socket with the shank extending through the aperture, and to be disposed substantially within the
20 socket when the flap is snap fitted under the locking formation.
2. A washer according to claim 1, wherein the flap is joined integrally to other parts of the washer, via the hinge, near one of the lateral walls of the socket, in
25 opposed relation to the locking formation.
3. A washer according to claim 2, wherein the washer has an unstressed shape, in which the flap extends outwardly in relation to the socket, and wherein the polymeric material of the washer is resilient, the flap being
30 stressed so as to be inherently biased against the locking formation when snap fitted under the locking formation.
4. A washer according to claim 2 or 3, wherein the locking formation comprises a curved lip extending from one of the lateral walls of the socket and wherein the flap has
35 a curved edge adapted to fit under the curved lip when the flap is snap fitted under the curved lip.



5. A washer according to any one of the preceding claims, wherein the washer has a recess adjacent the flap to facilitate prying the flap from under the locking formation.
- 5 6. A fastening assembly comprising a fastener having a head and a shank and a washer in accordance with any one of the preceding claims.
7. A fastening assembly according to claim 6, wherein the fastener is a screw.
- 10 8. A fastening assembly according to claim 6, wherein the fastener is a drive pin.
9. A washer substantially as described with reference to the accompanying drawings.
10. A fastening assembly substantially as described with reference to the accompanying drawings.
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