June 24, 1969 H. W. ARNOLD ETAL 3,451,169

EDGE PROTECTOR

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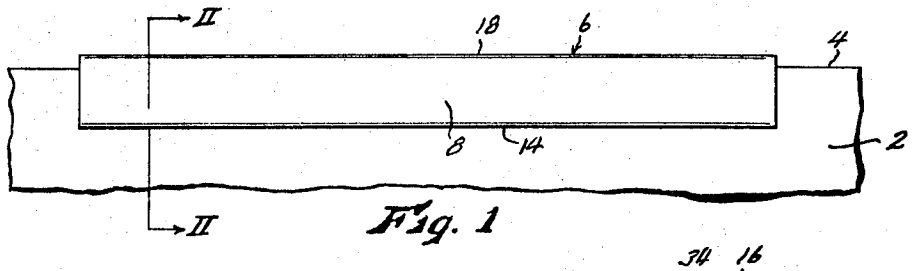

Fig. 1

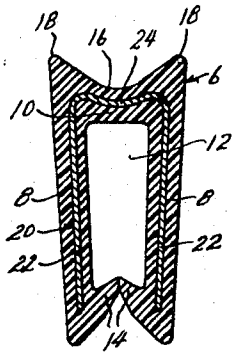

Fig. 3

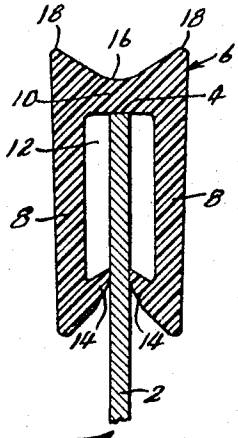

Fig. 2

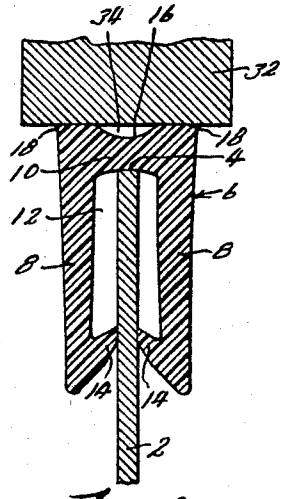

Fig. 4

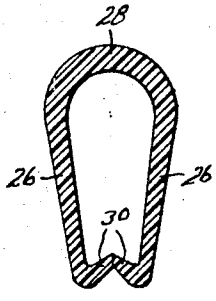

Fig. 5 PRIOR ART

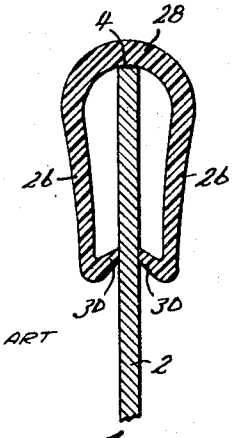

Fig. 6 PRIOR ART

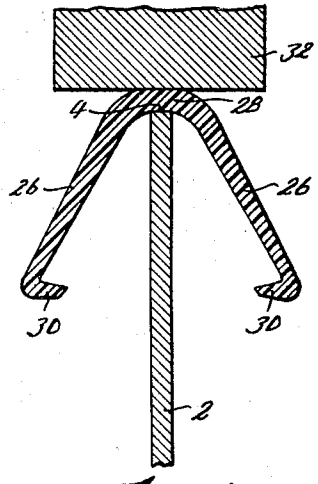

Fig. 7 PRIOR ART

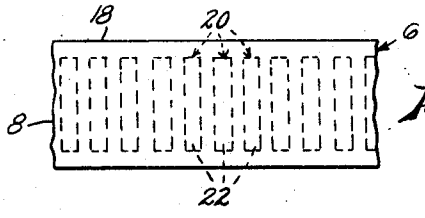

Fig. 8

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EDGE PROTECTOR

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ABSTRACT OF THE DISCLOSURE

A protector adapted to be applied over the edges of glass, metal or other sheet materials, and operable to prevent the sharp edges of said materials from scratching, cutting or otherwise damaging other articles with which they may come in contact. It consists of a generally U-shaped channel the legs of which are resiliently biased toward each other to grip the edge portion of the sheet material to hold the protector in place. A particular feature is the formation of the external surface of the base connecting portion of the channel with a transversely concave configuration, whereby external blows thereon will have no tendency to release the grip of the protector on the material, and whereby the shock-absorbing properties of the protector are enhanced.

This invention relates to new and useful improvements in edge protectors, and has particular reference to edge protectors of the class consisting of a generally U-shaped channel formed of a flexible, resilient material such as certain types of plastics, which is sufficiently soft not to scratch metal or other hard surfaces, and which is produced with the opposed walls thereof resiliently biased toward each other whereby to grip the edge portion of a sheet of glass, metal or other material therebetween to hold the protector in place. Such edge protectors are highly desirable, for example, when large numbers of finished sheets of metal or the like must be shipped, stored or the like, since they prevent the sharp edges of said sheets from cutting, scratching, marring or otherwise damaging other sheets, or cutting and destroying paper or other wrappers in which the sheets may be enclosed, or cutting the hands of workmen, etc. They also tend to protect the edges of the sheet to which they are applied, as for example to minimize denting thereof by edge blows thereon, and in the case of enameled or otherwise coated sheets, to prevent scraping contact of the edges of the sheet with obstacles, which could peel the coating away from the sheet for a considerable distance from its edge. The specific usages of edge protectors of this type are too numerous to catalog in detail.

Edge protectors of this general character are presently in use, but are subject to certain general objectionable features. Principally, it has been found that while they do effectively prevent the edges of an article protected thereby from damaging other articles, their U-shaped base connecting portions are rather thin and seat solidly on the extreme edges of the protected articles, and therefore have rather poor shock-absorbing properties in preventing damage to the articles themselves, in that said article edges may still be dented or otherwise damaged rather easily by external blows on the protectors. Furthermore, it has been found that as long as the connecting base portion of the channel is of the usual U-shaped configuration, a sharp external blow thereagainst has a pronounced tendency to spring the legs of the channel apart, with the result that the frictional grip of said legs on the edge portion of the protected article is permanently impaired or even completely destroyed. Thus in subsequent handling,

the protector may fall away and leave the article edge exposed, defeating all of the intended functions thereof.

Accordingly, the principal object of the present invention is the provision of an edge protector of the general character described having a novel configuration which largely obviates the above described objectionable features of prior devices, in that it both greatly improves the shock-absorbing properties of the protector, and also greatly reduces any possibility that a sharp external blow will loosen the frictional grip of the protector. Generally, this object is accomplished by imparting a transversely concave contour to the external surface of the connecting base portion of the protector channel, the ribs of said protector formed by said contour being spaced apart, transversely of the protector, by a distance greater than the thickness of a sheet article protected thereby.

Other objects are simplicity and economy of construction, efficiency and dependability of operation, and adaptability for use in a wide variety of applications.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawing, wherein:

FIG. 1 is a fragmentary face view of a sheet of material with an edge protector embodying the present invention applied operatively thereto,

FIG. 2 is anlarged fragmentary sectional view taken on line II—II of FIG. 1,

FIG. 3 is a view similar to FIG. 2 showing the edge protector only, and showing a slightly modified construction,

FIG. 4 is a view similar to FIG. 2, showing the deformation of the protector caused by an external blow,

FIG. 5 is a view similar to FIG. 3 of an edge protector of the type presently in use,

FIG. 6 is a view similar to FIG. 2, but showing the edge protector of FIG. 5,

FIG. 7 is a view similar to FIG. 4, but showing the deformation of the FIG. 5 protector resulting from an external blow, and

FIG. 8 is a reduced side elevational view of the protector shown in FIG. 3.

Like reference numerals apply to similar parts throughout the several views, and the numeral **2** applies to a sheet of material such as sheet metal, the edge **4** of which is to be guarded and shielded by an edge protector. Edge **4** may be either straight, as shown, or curved. The edge protector contemplated by the present invention is indicated generally by the numeral **6**, and is illustrated in FIGS. 1–4. It consists of an elongated channel formed of a comparatively soft, flexible but resilient material such as certain types of plastics. A medium-density polyethylene material is perhaps the most commonly used. It is of uniform cross-sectional contour, and can be formed by an extrusion process in continuous lengths, then cut with shears or the like into any lengths which may be necessary or desirable for any particular job.

In contour, the protector constitutes a generally U-shaped channel having spaced apart, generally parallel legs **8** joined together by a conecting base portion **10** formed integrally therewith. The throat **12** of the channel has a width, being the spacing between legs **8** adjacent base **10**, greater than the thickness of the thickest sheet to which the protector is to be applied. Stated in other words, this throat width limits the thickness of sheet material on which any given protector can be used. Each leg **8** has an integral inwardly extending tooth **14** extending continuously along the free edge thereof. The protector is produced so that when it is at rest as in FIG. 3, before it is applied to sheet **2**, teeth **14** are either substantially in engagement with each other, or are urged positively against each other by the resilience of the channel material. Thus when the protector is applied over the edge

portion of sheet 2, as shown in FIG. 2, the resulting outward flexure of legs 8 presses teeth 14 firmly against the faces of the sheet to hold the protector in place by friction. Actually, two or even more teeth could be formed on each channel leg, within the scope of the present invention.

The particular feature of the present invention is the contour of the outer surface of the connecting base portion 10 of the channel. This surface is formed with a transverse concave curvature as shown at 16. This curvature is rather deep, and the general thickness of the base is increased to provide a full thickness of channel material along the centerline of the base, directly over edge 4 of sheet 2, despite the concavity. It will be seen also that this concavity results in a pair of upwardly projecting ribs 18 extending longitudinally of the channel respectively at the opposite lateral edges of base 10, and that the lateral spacing between the apices of these ribs is greater than the width of channel throat 12. The purposes of this configuration will be more fully explained below.

To provide a stronger frictional grip on sheet 2, edge protectors of this general class are sometimes provided with cores of spring steel or the like, said core constituting a channel 20 formed of spring metal and completely embedded in the plastic channel as indicated in FIG. 3. Said channel has legs 22 embedded in the plastic legs 8, and a connecting base portion 24 embedded in the plastic base 10. If such metal reinforcement in a protector as contemplated by the present invention, the base portion 24 thereof should also be outwardly concave substantially concentrically with concave surface 16 of the plastic base, as shown. The sheet metal reinforcing channel is ordinarily not continuous, in order not to interfere with the flexibility of the protector which permits it to be fitted on curved edges. Insead, it is of skeleton form consisting for example of a continuous series of narrow spring metal clips spaced apart longitudinally of the protector.

FIGS. 5, 6 and 7 shows a plastic edge protector such as is presently used. It is in most respects similar to that shown in FIGS. 1–4 constituting a plastic channel having generally parallel legs 26 joined by a connecting base portion 28, and having inwardly projecting teeth 30 along the free edges of said legs. However, the base portion 28 thereof is ordinarily of simple U-shape as shown, externally as well as internally. It is adapted to be applied to a sheet 2 in the same manner as in FIG. 2, the edge 4 of the sheet butting firmly against the interior side of the protector base portion, and may also have a spring metal reinforcing core as in FIG. 3. However, certain objectionable characteristics have been observed in the functioning of the ordinary edge protector of FIGS. 5–7, particularly where, as illustrated in FIG. 7, impact occurs between an obstruction, represented at 32, and the external surface of the base portion 28 of the protector. Firstly, edge 4 of sheet 2 is covered only by a solid thickness of plastic seated directly over said edge, and obstruction 32 impinges directly over said edge. Since even softer plastics of which the protector may be formed have very little cushioning effect in such thin sections, bending or denting of sheet 2 often results even from relatively light blows against obstructions. Secondly, it has been observed, as shown in FIG. 7, that a blow directly over edge 4 against base portion 28 of the connector has a rather pronuonced tendency to spring legs 26 of the protector apart, also as shown in FIG. 7, though the degree of separation is somewhat exaggerated in the drawing for purposes of illustration. The legs may recover resiliently from this deformation to some extent, but often not enough to restore the frictional grip of teeth 30 against the faces of sheet 2. As a result, during subsequent handling of sheet 2, the protector may fall away from the sheet so that its protection is entirely lost. This effect is more pronounced with plastic protectors, since plastic has a rather low coefficient of elastic recovery from strain, but is nevertheless clearly observable even in protectors having spring metal reinforcing cores as in FIG. 3.

The protector of the present invention, as shown in FIGS. 1–4, largely overcomes these difficulties. FIG. 4 illustrates the deformation of the protector when impact with an obstruction 32 occurs. The ribs 18 tend to flex downwardly and laterally outwardly from the opposite faces of sheet 2, as shown. The yieldability of the ribs themselves thus provides a cushioning effect tending to protect sheet 2 against damage. Secondly, concavity 16 of channel base 10 prevents impact of obstruction 32 against the channel base directly over the edge 4 of the sheet 2, allowing a cavity 34 to remain therebetween at least with impacts over a wide range of intensities, also as shown in FIG. 7. This avoids solid and direct impact directly over edge 4, hence tending further to reduce possible damage to sheet 2. Thirdly, as a result of impact force against ribs 18, base 10 of the protector is flexed transversely about a longitudinal axis or fulcrum provided by sheet edge 4, and the resilient resistance of said base to such flexure provides a further cushioning effect. Fourthly, the transverse flexure of base 10 resulting from a blow as described forces legs 8 of the channel forcibly inwardly against the faces of sheet 2, precluding any possibility that they will be sprung outwardly as in FIG. 7. Thus external blows on the protector cannot loosen its frictional grip on the sheet 2 as with protectors in present use. In order to produce the transverse flexure of base 10 must effectively, this flexure being perhaps the central or key feature of the invention, it will be apparent that the apices of ribs 18, which result from concavity 16, should be spaced apart transversely of the channel as far as possible within reasonable limits of overall dimensions, since this provides maximum horizontal spacing between the plane of sheet 2 and the vertical planes of said apices, and this in turn provides the greatest possible impact leverage for flexing base 10. It will be apparent also that the lateral spacing between ribs 18 should in any event be greater at least than the thickness of sheet 2, since otherwise no flexing of base 10 could occur. For this reason, the spacing of ribs 18 should be greater than the thickness of channel throat 12, in order that the described flexure will occur even when the protector is applied to the thickest possible sheet to which it can be applied. All of the advantages as discussed above occur, in varying degrees, even if the channel is provided with a reinforcing spring metal core 20 as in FIG. 3, so long as the connecting base portion 24 of said core channel is outwardly concave as shown.

Finally, it is to be noted that the width of throat 12, directly adjacent base 10, should preferably be greater than the thickness of sheet 2, so that only the teeth 14 of legs 8 actually engage said sheet. In this manner, the inward flexure of said legs, caused by an imjact blow as already described, is caused to be distributed throughout the lengths of said legs, rather than being concentrated at the junctures of said legs with said base, as it would be if said legs contacted the sheet throughout their lengths. This greatly reduces any possibility that the legs themselves could be permanently deformed by such flexure.

While specific embodiments of the invention have been shown and described, it will be readily apparent that many minor changes of structure and operation could be made without departing from the spirit of the invention as defined by the scope of the appended claims.

What we claim as new and desire to protect by Letters Patent is:

1. An edge protector comprising an elongated generally U-shaped channel formed of flexible resilient material, said channel comprising generally parallel legs and a connecting base portion joining corresponding longitudinal edges of said legs, said legs being spaced apart transversely of said channel to define a throat therebetween for the reception of the edge portion of a sheet article, whereby said sheet is frictionally gripped between said legs, the edge of said article being adapted to abut the interior side of said connecting base portion, the ex-

terior side of said connecting base portion, the exterior surface of said connecting base portion being transversely concave whereby to provide longitudinally extending ribs respectively at the transversely opposite edges thereof, said legs being spaced apart at their juncture with said base portion by a distance greater than the thickness of the sheet article to be inserted therebetween, whereby said legs can engage said sheet only adjacent the free edges of said legs, and the lateral spacing between said ribs being greater than the thickness of said sheet article.

2. An edge protector as recited in claim 1 wherein each of said legs is provided along its free edge with an inwardly projecting tooth operable to engage said sheet article.

3. An edge protector as recited in claim 1 wherein the lateral spacing between said ribs is greater than the lateral spacing between said legs at their juncture with said base portion.

4. An edge protector as recited in claim 1 with the addition of a spring metal core embedded in said channel, said core being substantially U-shaped, having a pair of legs embedded respectively in said channel legs and a

connecting portion embedded in said channel base portion, the connecting portion of said core being outwardly concave.

5. An edge protector as recited in claim 4 wherein said core comprises a series of said U-shaped members embedded in said channel in longitudinally spaced apart relation therealong.

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