

May 31, 1966

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3,253,591

FOOT CUSHIONS CARRIED BY THE FOOT

Filed Sept. 30, 1963

2 Sheets-Sheet 1

fig. 1

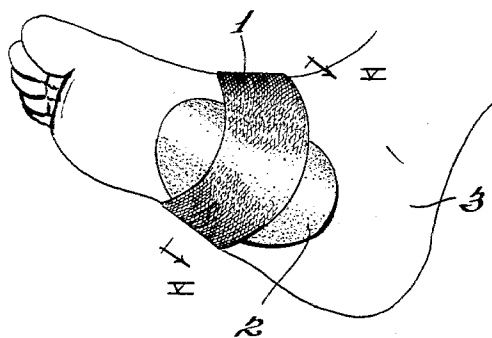


fig. 2

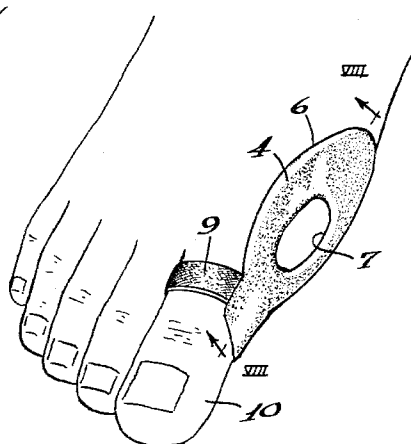


fig. 3

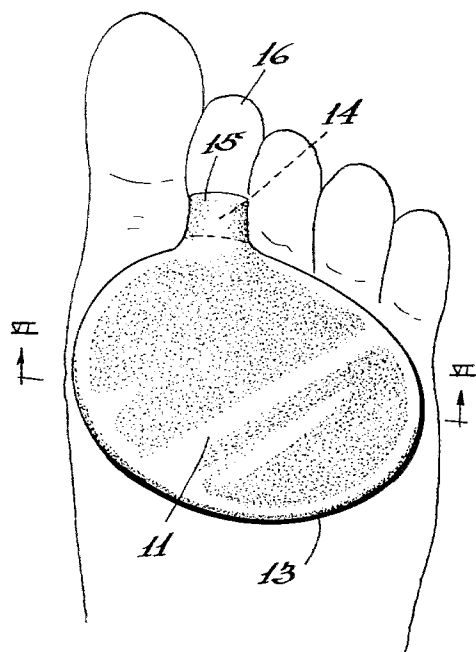
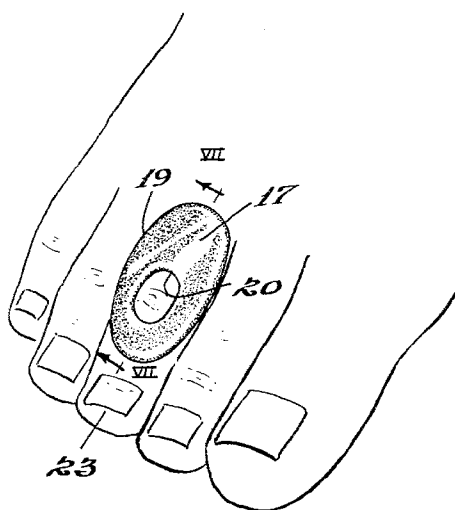


fig. 4



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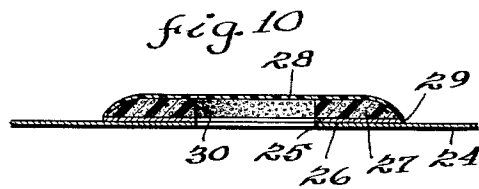
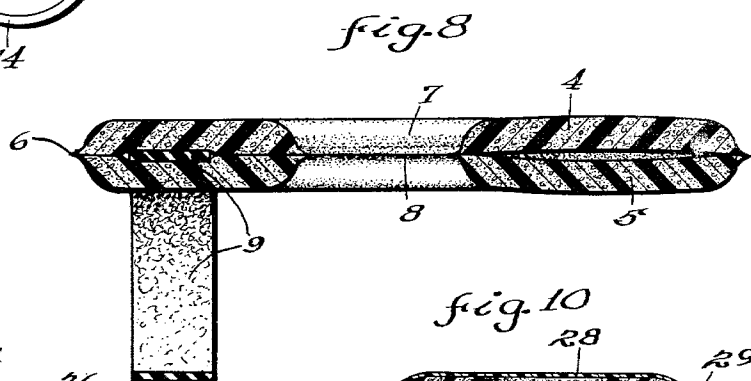
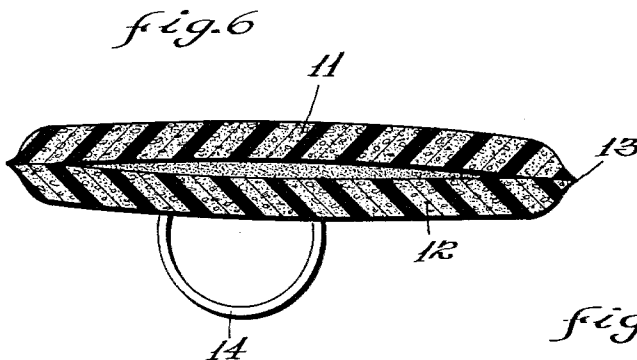
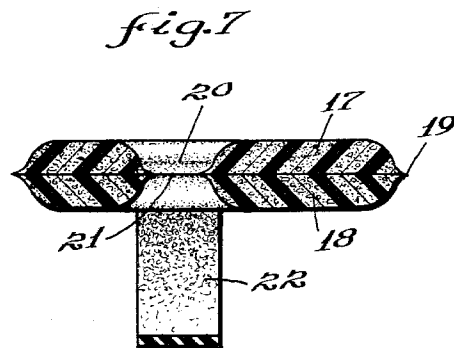
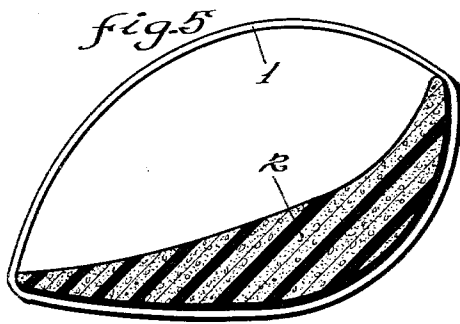
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FOOT CUSHIONS CARRIED BY THE FOOT

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2 Sheets-Sheet 2



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FOOT CUSHIONS CARRIED BY THE FOOT
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 10 Claims. (Cl. 128—153)

This invention relates to improvements in foot cushions carried by the foot, and more particularly to corrective foot cushions for alleviating the aggravating conditions of depressed or fallen arches, calluses, corns, bunions, hammer toes, and other and various foot afflictions, the corrective cushions being of the type that are attached directly to the foot either by way of a toe loop, adhesive tape, strapping, or by way of adhesive carried by the cushion itself, the cushions being made in many and various shapes and sizes depending upon the particular afflictions they are designed to remedy, all as will be apparent to one skilled in the art.

Pads of various sizes and kinds for the same purposes have been heretofore made utilizing padding, fleece, felt, sponge rubber, foam rubber, thermoplastic foams, and other materials to act as the cushion. In many instances these materials were covered with fabric, plastic film, and other materials. Such pads, as made heretofore, were disadvantageous, mainly because they did not promptly conform to the contour of the part of the foot with which they were in contact, take a partial set, and retain that contour a relatively long period of time after pressure of footwear or the foot had been removed. Consequently if one of the pads was removed temporarily during bathing, sleeping, or for some other reason, difficulty was experienced in accurately replacing the pad in the proper position upon the foot. With pads made of felt, padding, fleece, and similar substances should they ultimately acquire a partial shape in keeping with the part of a foot they were by then so compacted as to be ineffective for good remedial results; i.e. substantially worn out. Pads made of resilient foam latex or thermoplastic foams and the like have practically an instant recovery factor and immediately upon relief of pressure assume their original shapes. Such pads were not only difficult to replace after removal in the same position as before, but were also subject to slippage. In many cases as well, formerly known pads of this type were short lived to an objectionable extent. Consequently, with devices of this type heretofore known it was virtually impossible to acquire a really accurate fit of the device against the foot in the region of contact with the foot.

With the foregoing in mind, it is an important object of the instant invention to provide a foot cushioning device for direct attachment to the foot, which device is self-conforming to intimately fit the portion of the foot against which it has contact and take at least a partial set so as to retain its conformed shape for a relatively long period of time after pressure on the device is removed.

Another object of this invention is the provision of a foot cushioning and corrective device for attachment directly to the foot and which upon the application of foot or shoe pressure thereupon almost instantly assumes a shape complementary to the portion of the foot it contacts, and which is possessed of a low recovery factor, so that the conformed shape is retained to a material extent long after pressure has been removed.

A further feature of the instant invention is the provision of a foot cushioning and corrective appliance for attachment directly to the foot, which appliance immediately upon the application of a pressure conforms to the exact shape of the part of the foot it rests against and has such a low recovery factor that if used regularly, it will retain its conformed shape a relatively long time

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after removal whereby it may be readily and easily replaced upon the foot in the proper and correct position it had before, and the advent of slippage at any time is minimized.

It is a further feature of this invention to provide a foot cushioning device for attachment to the foot, which device embodies a thermoplastic foam cushioning material that is substantially non-porous and air impervious, and which is preferably a closed cell structure so that it will be self-conforming to the part of the foot it contacts immediately upon the application of pressure and retain its conformed shape for a material length of time after removal of pressure.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a fragmentary perspective view of a device embodying principles of the instant invention, showing the same in operative position on a human foot;

FIGURE 2 is a fragmentary perspective view illustrating a device of different shape, but embodying principles of the instant invention in operative position upon a foot;

FIGURE 3 illustrates a different form of the invention in operative position on the human foot;

FIGURE 4 illustrates still another form of the invention in operative position upon a foot;

FIGURE 5 is an enlarged vertical sectional view through the device of FIGURE 1 removed from the foot taken substantially as indicated by the line V—V of FIGURE 1, looking in the direction of the arrows;

FIGURE 6 is a greatly enlarged vertical sectional view of the structure shown in FIGURE 3 taken substantially as indicated by the line VI—VI of FIGURE 3;

FIGURE 7 is a greatly enlarged vertical sectional view taken substantially as indicated by the line VII—VII of FIGURE 4;

FIGURE 8 is a a greatly enlarged vertical sectional view taken substantially as indicated by the line VIII—VIII of FIGURE 2;

FIGURE 9 is a fragmentary diagrammatic view illustrating the action of the cushioning material of the instant invention; and

FIGURE 10 is a vertical sectional view through another form of the invention illustrating a different method of attachment to the body.

As shown on the drawings:

As stated previously, the instant invention may be made in various shapes and sizes, depending upon what particular affliction a particular size and shape of cushioning device is to remedy. By way of example therefore, and not by way of limitation, I have shown several sizes and shapes of the invention for alleviating discomfort due to afflictions on various parts of the foot. Any of the devices may be easily attached directly to the foot of the user in the region of the particular affliction.

The first illustrated form of the instant invention, seen in FIGURES 1 and 5, is a device for alleviating the effect of a fallen longitudinal arch of the foot. This device comprises an elastic band 1 inside of which is a preformed block or piece 2 of thermoplastic foam, this block or piece being shaped to underlie the longitudinal arch of the foot. As seen in FIGURE 1, where the device is properly applied to a human foot 3, the elastic band 1 circumscribes the foot around the instep, and the block 2 is held against the inner longitudinal arch of the foot. The foot is then relieved of discomfort by the device whether or not an article of footwear is worn at the time,

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and the device performs its remedial function even though the wearer be barefoot.

In FIGURES 2 and 8, the invention is shown in a form to provide relief for hallux valgus, bunions, and similar afflictions. In this instance the device comprises two superposed layers 4 and 5 of thermoplastic foam joined together by a heat seal seam 6 around the bounding edge of the device, this seam 6 preferably being a fine line heat seal seam. The layers are complementally apertured in an intermediate region of the device as indicated at 7 and a fine line heat seal seam 8 joins the layers around the opening 7. A toe loop 9 may be inserted between layers near the forward end of the device as seen clearly in FIGURE 8, and this toe loop may be of commonly known fabric elastic tape, thermoplastic film, or any suitable material. When this device is applied to the foot, the loop 9 may be engaged over the large toe 10 as seen in FIGURE 2, and the device extends rearwardly along the inner side of the foot so as to receive the enlarged metatarsal joint within the aperture 7 so that the body portion of the device may relieve shoe pressure from the affliction and transfer that pressure to healthy tissue therearound. The device will be held in place by hosiery during use.

Another form of the invention is illustrated in FIGURES 3 and 6 and in this instance the invention is shaped and sized to underlie the plantar surface of the foot in the region of the metatarsal arch. This form of the device relieves calluses on the sole of the foot in this location, pain from a fallen metatarsal arch, the discomfort effected by supernumerary or sesamoid bones, burning caused by high heel shoes, and the device compensates for reduction in tissue beneath the metatarsal heads which occurs as a person grows older. In this instance, the device comprises superposed layers 11 and 12 of thermoplastic foam, preferably given a somewhat oval shape, and secured together by a fine line heat seal seam 13 defining the bounding edge of the body part of the device. A toe loop 14, preferably of elastic material, may be provided in any suitable manner, such as placing the loop between an offset neck portion 15 on the body, and this toe loop will be caught and held in the aforesaid heat seal seam 13. When this form of the invention is put to use, as seen in FIGURE 3, the offset toe loop 14 is disposed around the second toe 16 of a foot, and the body of the device underlies the region of the foot beneath the metatarsal arch. It is preferable to have the toe loop offset and to make the devices individually for left and right feet to insure better fit.

In FIGURES 4 and 7 I have illustrated the invention sized and shaped to relieve the aggravating and painful effects resulting from hammer toe. In this instance the device embodies upper and lower layers 17 and 18 of thermoplastic foam joined around the bounding edge of the body part of the device by a fine line heat seal seam 19. The layers are intermediately apertured as indicated at 20, and joined by a fine line heat seal seam 21 defining the aperture. The device may be provided with a digit loop 22, preferably elastic, in the manner above described. With reference to FIGURE 4, it will be seen that when this device is put to use, it is disposed on top of a toe 23, such being a hammer toe, with the digit loop 22 encircling the toe and with the device disposed so that the corn usually present on top of the toe with this affliction is received within the aperture 20. The device extends rearwardly from the aperture farther than it does forwardly of the aperture to relieve pressure from the corn, and gently urge the toe into straightened position.

In FIGURE 10 I have illustrated the invention in the form of a corn or callous pad that is adhesively attached to the foot of the user. In this instance, the pad may be formed directly upon a facing sheet 24 provided with a release surface thereon, this being merely an adhesive protective sheet that is removed and discarded when the device is put to use. Superposed on the facing sheet is a lower thermoplastic film 25 such as vinyl or acetate film

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carrying a pressure sensitive adhesive on its undersurface at 26. On that film 25 is a layer 27 of thermoplastic foam and, if desired, a cover film 28 of heat sealable material may be included. The two film layers and the foam layer 27 are all joined together by a fine line heat seal seam 29 defining the bounding edge of the pad. In most cases an aperture 30 will be disposed through the lower film and the thermoplastic layer, the upper film, if used, preferably overlying the aperture to prevent contact with clothing of exudation from an affliction or medicament. When the device is put to use, it is a simple expedient to tear off the facing sheet 24 from the pressure sensitive adhesive surface 26 and adhesively secure the pad to the body of the user with the particular affliction received within the opening 30.

All of the above described sizes and shapes of the invention may be readily made from superposed layers of stock material in a suitable electronic heat sealing press, with a die shaped in accordance with the desired shape of the resultant device. Such an electrode die may be brought down upon the layers under pressure, and upon an almost instantaneous charge of high frequency current the layers are fused together to form the heat seal seams above mentioned, and at the same time a tear seal seam is established so that waste stock may readily be stripped from the product.

In all forms of this invention, the thermoplastic foam material utilized as the cushioning means is preferably from the group of foams including the vinyl foams, isocyanate or polyester, polyurethane, and similar foams. Such foams are cellular, can be porous, non-porous, air pervious or impervious, have various densities, and various other physical properties depending upon particular formulas used and the control exercised during the making of the foam, as is apparent to those skilled in the art. In most instances, such foams will be made with a high recovery factor, so that they will return to their original shape almost instantaneously upon the removal of pressure. Such high recovery foams merely yield to pressure but do not, in effect, mold themselves intimately to the contour of the surface they contact when under pressure. Desiderata of the instant invention are the use of self-conforming foam, and extremely slow recovery from the conformed shape upon the removal of pressure.

By way of specific example, one such foam that has been proven highly satisfactory in tests and in actual usage, is what might be termed a fully cured, closed cell, homopolymer polyvinyl chloride foam which is diagrammatically shown in FIGURE 9. This foam generally indicated by numeral 31 in effect comprises a skeleton 32 defining closed cells 33. The foam has a skin on each side thereof as indicated at 34 and 35 which adds strength and enhances slow recovery of the foam since the skin substantially seals out air. The foam preferably has closed cells within the range of 70% to 100%. Accordingly, the foam is substantially non-porous and air impervious. The density of the foam may satisfactorily be approximately 10 pounds per cubic foot.

While the foam may be made in substantially any desired thickness, as is apparent from the showing in FIGURE 5, where layers of foam are utilized, a satisfactory thickness is approximately $\frac{1}{8}$ inch for each layer. Foam of this thickness was placed under what might be termed 50% compression set tests, and in the particular tests utilized, the foam was placed for 22 hours at 158° F. under a load sufficient to reduce the foam thickness to approximately 50% of its original thickness. At the end of 22 hours the load was taken off and the material allowed to recover for two hours at 158° F. and then brought to room temperature before recovery was measured. The average for a series of such tests was approximately 42% set, and 58% recovery over the two-hour period. In use at room or body temperatures, recovery is even slower.

Owing to the skin on each side thereof, the foam need

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have no covering thereon, it being sufficiently smooth for hosiery to pass thereover even when handled carelessly, and it provides a smooth clinging comfortable feel to the flesh of the user.

When a cushioning device embodying principles of the instant invention is attached to the foot of a user, the thermoplastic foam cushioning part of the device will almost immediately upon the application of pressure conform or mold itself intimately to the contour of the part of the foot it contacts. For example, if there is a protuberance of the foot contacted by the foam material, there will be a depression as indicated at 36 in FIGURE 9 in the foam, and that depression will not be just a general hollow, but will intimately follow the exact contour and outline of the protuberance. The foam so faithfully conforms itself to the body that prints of the skin will be in the foam. While the foam may be said to set under pressure against the foot, it nevertheless retains its cushioning properties. For example, as indicated in FIGURE 9 the foam in the left-hand portion of the figure is shown at its normal height but under general pressure the foam would decrease in thickness as indicated in the right-hand portion of the figure, yet there is always sufficient foam beneath any pressure point to provide an ample cushion.

Due to the low recovery factor of the foam, a device may be removed from the foot of the user for sleeping, bathing, or other purposes, and while there is bound to be some recovery upon removal of the device full recovery will not occur over an extremely long period of time. If the device is regularly worn, full recovery will not take place overnight. If the removal for a short period of time, say for one hour, the recovery will not be noticeable to the user. Consequently, the instant invention provides a distinct advantage over devices heretofore known for similar purposes. Upon replacement of the device, the user is not put in the position, so to speak, of starting over again with a new device. The device is already shaped to fit the particular location on the foot it formerly occupied, and fit in a comfortable and alleviating manner instantaneously. It is a simple expedient, therefore, to place the device in exactly the position it formerly occupied on the foot and there is no need for any discomfort upon replacement of the device while the foot adapts itself to that device again.

From the foregoing, it is apparent that I have provided an economical, long lived, and extremely efficient foot cushioning and correcting device for attachment directly to the human foot. The device is self-conforming and almost immediately assumes an intimate fit for the foot surface it contacts, and the pattern or shape assumed by the device remains for a considerable time after pressure is removed, and the cushioning effect of the device is at all times present regardless of the conforming of the device, when in use.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A foot cushioning device comprising a body part of thermoplastic foam cushioning material which is self-conforming under pressure to the surface contour of a foot and possessed of a low recovery factor of less than 70% in a two-hour interval after removal of pressure, and means connected to said body part to attach said device directly to the foot of a user.
2. A foot cushioning device comprising a body part of thermoplastic foam cushioning material which is self-conforming under pressure to the surface contour of a foot and possessed of a low recovery factor of less than 70% in a two-hour interval after removal of pressure, said material being substantially non-porous and air impervious, and

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means connected to said body part to attach said device directly to the foot of a user.

3. A foot cushioning device comprising a pair of superposed layers of thermoplastic foam cushioning material having an integral impervious skin on each side of each layer and forming a body part of the device, at least one of said layers comprising a thermoplastic foam cushioning material which conforms responsive to foot-applied pressure to the surface contour of a foot and is possessed of a low recovery factor of less than 70% in a two-hour interval after removal of pressure, a heat seal seam joining said layers adjacent the perimeter of said body part, and means connected to said layers to attach the device directly to the foot of a user.
4. A foot cushioning device comprising a layer of thermoplastic foam cushioning material having an integral skin on each side thereof eliminating the need of a covering, said layer being self-conforming under foot or shoe pressure to the surface contour of a foot and having a low recovery factor, and means connected to said layer to attach the device to the foot of a user.
5. A foot cushioning device comprising a pair of superposed layers of thermoplastic foam cushioning material having an integral impervious skin on each side of each layer, a heat seal seam joining said layers around the perimeter of the device, said layers being self-conforming under pressure to the surface contour of a foot and having a low recovery factor when pressure is removed, and a loop connected to said layers to secure the device to the foot of a user.
6. A foot cushioning device comprising a pair of superposed layers of closed cell thermoplastic foam cushioning material, a heat seal seam joining said layers around the perimeter of the device, said layers being self-conforming under pressure to the surface contour of a foot and having a low recovery factor to retain the conformed shape a relatively long time after removal of pressure, and a loop to encircle a part of the foot connected to said layers to hold the device on the foot of a user.
7. A foot cushioning device comprising a body part of closed cell homopolymer polyvinyl chloride foam having a skin on each side thereof, which is substantially non-porous and air impervious and almost instantly self-conforming under pressure to the surface contour of a foot and having a low recovery factor not exceeding 70% for a two-hour interval after release of pressure, and attaching means connected to said body part for securing the device to the foot of a user.
8. A foot cushioning device comprising a block of thermoplastic foam cushioning material self-conforming under pressure to the surface contour of a foot and having a low recovery factor of less than 70% in a two-hour interval after pressure removal, and an elastic band connected to the device to encircle a part of a foot and hold the device in proper position thereon.
9. A foot cushioning device comprising a layer of thermoplastic foam material self-conforming under pressure to the surface contour of a foot and having a low recovery factor of less than 70% in two hours after pressure removal, a thermoplastic film, a spread of pressure sensitive adhesive on one face of said film, and

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a heat seal seam joining said layer and said film with said adhesive on the exposed side of said film.

10. In a foot cushioning device,

a layer of fully cured closed cell homopolymer polyvinyl chloride foam having an integral skin on each side thereof making the foam substantially non-porous and air impervious,

said foam being self-conforming under foot-applied pressure to the surface contour of the part of a foot it contacts and possessed of a low recovery factor of less than 70% in a two hour interval after removal of pressure thereon, and

means connected to said layer for attaching the device to the foot of a user.

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