A wire guide assembly comprises a pivotally supported wire bundle retainer which may be selectively positioned on a wire harness board or the like to guide and retain the wires during harness fabrication and then rotated to a release position wherein the retained wires may be conveniently removed from the wire bundle retainer by a simple, rapid, one step manipulation. The center of gravity of the wire bundle retainer may be selectively offset to one side of the longitudinal axis of its support post so that said retainer may freely fall to the harnessing position from the release position after the wires have been removed therefrom. Selectively located protrusions or notched portions may be employed to provide stop means for establishing the limits of arcuate travel of the wire bundle retainer. Locking means which may comprise an interlocking pin and groove arrangement may be provided to maintain a fixed orientation between the wire bundle retainer and the support post when mounted in other than a vertical position.

14 Claims, 14 Drawing Figures
WIRE GUIDE ASSEMBLY

BACKGROUND OF THE INVENTION:

1. Field of the Invention:
The invention is directed to the field of wire retainers and principally to a selectively positionable wire guide assembly.

2. Description of the Prior Art:
Prior art devices for directing and supporting one or more insulated wires during the fabrication of a wire harness on a wire harness board often comprised, simply a nail or similar relatively thin post affixed to the wire harness board at selective locations to direct the route of the wires from one point to another. Such nail-like devices were generally set at the juncture between two or more diverse paths, such as a corner or a break-out point, and the wires thereafter formed along the path of such nails while being drawn tight thereagainst. The relatively small diameter of the nail often caused excessive pressure to be exerted on the wires being routed thereagainst, causing the insulation covering such wires to flow away from the point of contact between the wires and the nail, thereby seriously reducing the integrity of the insulation thereof. Additionally, the wires tended to fan out along the shank of the nail in a form contrary to the generally circular configuration desired in such harnesses, the wires thereafter having to be reformed into the desired shape after removal from the wire harness board. Thirdly, where undue pressure were applied in forming the wires around such nails, the head of the nail would, in many cases, seriously interfere with the removal of the wires therefrom upon completion of the wire harness. Attempts to relieve this condition by removing the head of the nail prior to its insertion in the board often resulted in the undesirable formation of a relatively sharp edge, which could readily sever the wire insulation and cause injury to the user during fabrication of the wire harness. In U.S. Pat. No. 3,540,110 issued to R. S. Schwartz on Nov. 17, 1970 and assigned to the assignee of the instant invention, there is disclosed a guide device which, although somewhat of an improvement over the simple nail, comprises merely a non-rotatable wire guide removable attached to a fixedly mounted base member so that a bundle of wires engaged therewith must be forcibly displaced outwardly parallel to the supporting member or board to effect the release of the wires from the wire guide.

SUMMARY OF THE INVENTION:
The invention overcomes the limitations and difficulties noted above with respect to prior art devices by providing a unique wire guide assembly which is more reliable, versatile, efficient, and safer than such devices. The assembly comprises primarily two cooperating members, including a wire bundle retainer selectively formed to provide a wire receiving cavity defined by the inner opposing surfaces of two extending arms, and a support post upon which the wire bundle retainer may be either permanently or detachably pivotally mounted. The wire bundle retainer may be constructed so that its center of gravity is selectively offset to one side of the longitudinal axis of the support post to permit it to freely rotate towards a first or harness position from a release position angularly offset a predetermined amount therefrom when the support post is substantially vertically oriented. The wire bundle retainer may be formed with a notched portion having a partially confined pin receiving aperture so as to permit it to be readily snapped onto and removed from the support post, when desired, and may be further selectively notched to vary the point of pivot between the wire bundle retainer and the support post to decrease the displacement of the wire bundle as the wire bundle retainer is rotated from its harnessing position to its release position. The support post may have a simple U-shaped configuration with the free ends thereof being sharpened for insertion in a harness board or the like, or may comprise, in one embodiment, a selectively bifurcated member comprising an additional strut or pin selectively located between the legs thereof and cooperative with an additional notch in the wire bundle retainer to limit the rotation thereof. The additional notch may be constricted at a selective location spaced from the closed end of the notch so as to relesely engage the additional strut or pin to maintain the wire bundle retainer in a given position relative to the longitudinal axis of the support post. The wire bundle retainer may be conveniently molded from plastic material, while the support post may be fabricated preferably from metal or a suitable rigid plastic material to permit it to be driven into a wooden harness board or the like in a nail-like fashion, where necessary or convenient. Additional arms may be added to the wire bundle retainer to provide additional wire receiving cavities where, for example, a plurality of parallel cable runs are to be guided and retained along the same path. It is therefore an object of this invention to provide a novel wire guide assembly.

It is another object of this invention to provide means for guiding and retaining a plurality of wires during the fabrication of a wire harness.

It is a further object of this invention to provide a selectively pivotable wire guide assembly.

It is yet another object of this invention to provide a harnessing aid which may be rotated between two given positions to permit a plurality of wire engaged therewith to be conveniently released therefrom upon completion of the harness.

It is still another object of this invention to provide a self-aligning wire guide assembly.

It is yet another object of this invention to provide a wire guide assembly incorporating a selectively pivotable wire bundle retainer detachably coupled to a support member.

It is yet another object of this invention to provide a wire guide assembly means for rapidly, safely, and conveniently removing a plurality of wires from a wire guide assembly.

Other objects and features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose, by way of example, the principle of the invention and the best mode contemplated for carrying it out.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the Drawings:

FIG. 1 is a side elevational view, partly in section, of a pivotable wire guide assembly constructed in accordance with the concepts of the invention, showing each device in a harnessing position, in solid outline, and rotated away from said harnessing position, in dotted outline.
FIG. 2 is a side elevational view of the wire bundle retainer portion of the wire guide assembly shown in FIG. 1.

FIG. 3 is a front elevational view, in section, of the wire bundle retainer of FIG. 2 taken along the line 3—3 of FIG. 2.

FIG. 4 is a top plan view of the wire bundle retainer shown in FIG. 2.

FIG. 5 is a front elevational view of the support post of the wire guide assembly shown in FIG. 1.

FIG. 6 is a side elevational view, partly cut away and partly in section of the support post shown in FIG. 5.

FIG. 7 is a fragmentary side elevational view, partly in section, and partly cut away of the device of FIG. 1, showing the wire bundle retainer disposed in a release position.

FIG. 8 is a top plan view showing a harness board to which a selective arrangement of a plurality of wire guide assemblies constructed in accordance with the concepts of the invention have been affixed.

FIG. 9 is a side elevational view, partly cut away and partly in section, of a further embodiment of a wire guide assembly constructed in accordance with the concepts of the invention.

FIG. 10 is a fragmentary side elevational view of a further embodiment of the wire bundle retainer portion of a wire guide assembly constructed in accordance with the concepts of the invention.

FIG. 11 is a side elevational view, partly cut away and partly in section, of a further embodiment of a wire guide assembly constructed in accordance with the concepts of the invention.

FIG. 12 is a fragmentary perspective view of the head portion of the wire guide assembly support post shown in FIG. 11.

FIG. 13 is a fragmentary side elevational view, partly cut away and partly in section, showing a further embodiment of a wire guide assembly constructed in accordance with the concepts of the invention.

FIG. 14 is a fragmentary side elevational view, partly cut away and partly in section, showing a further embodiment of a wire guide assembly constructed in accordance with the concepts of the invention.

Similar elements are given similar reference characters in each of the respective drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Turning now to FIGS. 1, 2, 3, 4, 5, and 6 there is shown a wire guide assembly 20 constructed in accordance with the concepts of the invention. The wire guide assembly 20 comprises a support post 22 having a first leg 24 and a second leg 26. As may be more clearly seen in FIG. 5, the support post 22 is bifurcated along selected portions of its length to provide a first leg 28 and a second leg 30 between which is disposed a pin-like bearing 32. Pivotally coupled to the support post 22 is a wire bundle retainer 34 having a wire receiving cavity 36 defined by a pair of spaced arms 38 and 40, respectively. To pivotally couple the wire bundle retainer 40 to the support post 22 there is provided a pin receiving aperture 44 (FIG. 2) proportioned to rotatably engage the pin 32. A notched portion 46 extends from the pin receiving aperture 44 to one edge 48 of the wire bundle retainer 34 and is proportioned so that the wire bundle retainer 34 may be releasably coupled to the support post 22 simply by straddling the pin 32 with the notched portion 46 of the wire bundle retainer 34 and pushing the retainer 34 thereon until the pin 32 is seated in the pin receiving aperture 44. The width of the notched portion 46 at its juncture with the pin receiving aperture 44 is slightly smaller than the diameter of the pin 32 to provide a slight restriction thereat so that the wire bundle retainer 34 may be readily forced over the pin 32, thereby maintaining engagement between the retainer 34 and the pin 32, while still permitting a rapid disassembly of the two elements simply by reversing the above procedure. It will, of course, be clear to those skilled in the art that the notched portion 46 may be eliminated and the pin receiving aperture 44 totally confined to provide a more permanent assembly of the two elements. It has been found advantageous, however, to provide a detachable assembly where, for example, the support post 22 is to be driven into a supporting structure as with a nail or the like. In such case, the support post 22 would be detached from the wire bundle retainer 34 and forcibly urged into the supporting board or structure at the desired location by, for example, a blow from a hammer or the like. After the support post 22 has been properly seated in position, the wire bundle retainer 34 may then be snapped onto the support post to complete the assembly, thus avoiding possible damage to the retainer 34 during the post insertion step. To limit the insertion of the support post 22 into the supporting member, a transversely extending web portion 39 may be employed. Thus, the end 26 of the post 22 may be driven into the supporting member up to the bottom edge of the web portion 39 which will then abut the adjacent surface of the supporting member and limit further insertion of the post 22 thereinto. In lieu thereof, a shoulder like flange, ring, or protrusion (not shown) may be disposed about the periphery of the post 22 adjacent its second end 26 to effect a similar result. Where the support post 22 is mounted in a vertical position with respect to a horizontal supporting member such as 50 (FIG. 1), it has been found convenient to have the wire bundle retainer fall freely to the position shown, for example, in FIG. 1 in solid line, where the wire receiving cavity 36 is oriented in what may be described as a harnessing position where, for example, a bisecting axis of the wire receiving cavity 36 is oriented substantially normal to the longitudinal axis of the support post 22. This may be accomplished simply by fabricating the wire bundle retainer 34 so that its center of gravity is offset to the right of the longitudinal axis of the support post 22, as viewed in FIG. 1, when the post 22 and the wire bundle retainer 34 are in their assembled condition. Thus, the wire bundle retainer 34 will tend to pivot freely in a clockwise direction, as viewed in FIG. 1, to a position where the center of gravity of the wire bundle retainer 34 is aligned with the longitudinal axis of the support post 22. To limit the degree of rotation of the wire bundle retainer 34 so that it is maintained in a position essentially as shown in FIG. 1, there is provided a stop means which, in the embodiment illustrated in FIG. 1, comprises a raised portion 51 affixed to, or integral with, the wire bundle retainer 34 and so located on the retainer 34 as to abut the support post 22 in the first or harnessing position illustrated in FIG. 1. Although a single raised portion such as 51 may be provided and has been found generally adequate for the above mentioned purpose, an additional raised por-
tion 52 may be provided on the opposing side of the wire bundle retainer 34 and located thereon coincident with the raised portion 51 to provide a more balanced arrangement. It has also been found desirable to add the additional raised portion 52 to assist in providing a center of gravity offset to the right of aperture 24, as viewed in FIG 1. An alternate arrangement for limiting the rotation of the wire bundle retainer so that it is maintained in the first or harnessing position is illustrated in FIG. 13 where there is shown a wire bundle retainer 54 having a notch 56 selectively spaced above a lower edge 58 of the retainer 54. The notch 56 is proportioned to provide preferably a sliding fit over a pin 60 afixed to a support post 62. Thus, in the first or harnessing position, the closed end of the notch 56 abuts the pin 60 to limit the clockwise rotation of the wire bundle retainer 54 as viewed in FIG. 13. To prevent the inadvertent displacement of the wire bundle retainer 54 from its harnessing position either during use, or when the assembly is mounted in other than a vertical position, there is provided preferably a pair of deflectable protrusions 64 spaced from the closed end of the notch 56 a distance approximately equal to the diameter of pin 60 and extending inwardly towards one another to restrict the width of the notch 56 threat so that the pin 60 is releasably engaged between the protrusions 64 and the closed end of the notch 56. The wire bundle retainer 54 may be released from this position simply by applying a counterclockwise torque thereto sufficient to cause the pin 60 to be forced past the protrusions 64 towards the open end of the notch 56. It will, of course, be readily apparent to those skilled in the art that although a bifurcated support post has been described and illustrated, the post may be fabricated as a single elongate member (not shown) with a pin such as 32 or 60 extending normally therefrom. To limit the counterclockwise rotation of the wire bundle retainer 38 as viewed in FIG. 1, there is provided a second stop means shown in FIG. 1 as a raised portion 66 located at the upper left hand corner of the wire bundle retainer 34. The raised portion 66 is selectively located with respect to the support post 22 so as to abut the post 22 and limit further rotation of the wire bundle retainer 34 in a manner more clearly shown in FIG 7. As illustrated therein, the wire bundle retainer 34 is shown as having been rotated counterclockwise through an angle slightly more than ninety degrees from the first or harnessing position to a second or release position for the convenient removal of a bundle of wires 68 forming part of a completed wire harness designated by the numeral 70 in FIG. 8. When the wire bundle retainer 34 is in its second or release position, the wire bundle 68 may be lifted completely and unobstructively out of the wire receiving cavity 36. By maintaining the center of gravity of the wire bundle retainer 34 to the right of the longitudinal axis of the support post 22, as viewed in FIG. 7, when the wire bundle retainer 34 is in its release position, the retainer 34 will tend to fall back to its first or harnessing position upon removal of the wires 68 therefrom, thereby requiring no further manipulation or operation on the part of the user to reset the wire guide assembly 20 for the next operation. As with the raised portion 51, there may be provided either a single raised portion 66 extending outwardly from one surface of the wire bundle retainer 34, or a further raised portion 69 (FIG. 1) on the opposing side of the retainer 34 coincident with raised portion 66 to provide a more symmetrical and balanced arrangement where necessary or desirable. It will of course be clear that the specific angle through which the wire bundle retainer 34 may be rotated from its first or harnessing position to its second or release position may be readily governed simply by locating the raised portion 66 on the wire bundle retainer 34 so as to abut the support post 22 after a predetermined angle of rotation has been achieved. It has been found, however, that an angle of rotation in the range of from 95° to approximately 125° between the harnessing position and the release position will be adequate for most applications. Although generally little difficulty will be experienced in removing a wire bundle such as 68 from the wire bundle retainer 34 in the release position, it should be noted that the wire bundle 68 must undergo some displacement during the rotation of the wire bundle retainer 34. If the harness has been formed tightly about the wire guide assembly 20, it may tend to resist such displacement, to some extent, thereby increasing the force necessary to lift the harness out of the wire receiving cavity 36. It may therefore be found advantageous to reduce the amount of displacement to which the wire bundle 68 is subjected during the rotation of the wire bundle retainer 34 by providing an alternative arrangement as shown, for example, in FIG. 10. In this embodiment there is provided an additional notch 72 extending from a pin receiving aperture 45 in a predetermined arc towards the upper right corner of FIG. 10. The wire bundle retainer 35 may thus be simultaneously rotated and displaced from its initial pivot point in such manner as to permit the support post pin 32 to be disengaged from the aperture 45 and traverse the notch 72 while the wire bundle retainer 35 is being repositioned from its first or harness position to its second or release position. As shown in FIG. 10, the juncture between the notch 72 and the pin receiving aperture 45 is defined by a zone of restricted width designated as 74 through which the pin 32 must be urged to enter the notch 72. By fabricating the wire bundle retainer of sufficiently resilient material such as any one of a number of commonly employed thermoplastic compounds, the pin 32 may be readily slipped past the restrictive area and into the notch 72. The notch 72 is so placed with respect to the angle of rotation of the wire bundle retainer 35 as to cause the retainer 35 to be displaced to the left and downwardly towards the bottom of FIG. 10 during its rotation, so that the axis of the wire receiving cavity 37 is displaced to a much smaller degree than is the case in the embodiment illustrated in FIG. 1. Thus, the wire bundle 68 disposed within the wire receiving cavity 36 is, accordingly, caused to undergo a much smaller displacement than in the embodiment illustrated in FIG. 1. Turning now to FIG. 8 a plurality, of namely three, wire guide assemblies 20 are shown appropriately located on the supporting member 50 to guide the harness 70 along a predetermined harness configuration. Although each of the assemblies 20 is shown disposed at a point at which the harness 70 is required to make an approximately 90° bend, the assemblies 20 may additionally be employed along any straight run of the harness to provide at least a partial restraint and guide therefore. To fasten each of the assemblies 20 to the supporting member 50 the second end 26 of the support post 22 may be sharpened as illustrated for example in FIGS. 5 and 6, so that the support post 22 may
be conveniently driven into the supporting member 50 which, in many cases, is formed of wood or other similar resilient material. To facilitate this operation the support post 22 may be modified as shown, for example, in FIGS. 11 and 12 where there is illustrated a support post 76, the upper portion of which terminates in a head 78 which may be structured to withstand the blows of a hammer, or the like, to drive the post 76 into a supporting member such as 50. Although not illustrated, the second end of the support post may be provided with an apertured flange or base portion (not shown), enabling the wire guide assembly to be fastened to the supporting member 50 by threaded fasteners or the like. An alternative arrangement may comprise the use of an adhesive base for fastening the wire guide assembly to the supporting structure.

Turning now to FIG. 9 there is shown a further embodiment of a wire bundle retainer 80 constructed in accordance with the concepts of the invention. As illustrated, the wire bundle retainer 80 comprises three co-planar arms 82, 84 and 86, respectively, providing two wire receiving cavities 88, 90, respectively, where for example, it is desired to run a pair of cables along the same predetermined route during the fabrication of the wire harness while maintaining such cables separate and distinct from one another. In a similar fashion further arms may be provided to provide additional wire receiving cavities, where necessary or desirable. It will of course be readily appreciated that the wire bundle retainer 80, although shown configured essentially similar to wire bundle retainer 34 illustrated in FIG. 1, may be provided with additional notches and stop means as heretofore described with respect to the various embodiments set forth hereinabove.

Turning now to FIG. 11 there is illustrated a wire bundle retainer 92 specifically adapted for use with the support post 76. In this embodiment the wire bundle retainer 92 is provided with a recess 94 arranged to at least partially encompass the head portion 78 of the support post 76 as the wire bundle retainer 92 is rotated from its first or harnessing position to its second or release position. This arrangement permits the wire bundle retainer 92 to be preassembled to the support post 76 and the support post 76 thereafter driven into a supporting member after such assembly without damaging the wire bundle retainer 92 since the head portion 78 of the post 76 extends beyond the top of the wire bundle retainer 92 and is readily accessible for engagement by the head of a hammer or the like. It will of course be readily apparent to those skilled in the art that the remainder of the configuration of the wire bundle retainer 92 may be essentially duplicative of any one of the shapes heretofore described without departing from the spirit of the invention and within the concepts herein disclosed.

Where it is desired to more securely retain the individual wires of the harness during its fabrication, an arrangement similar to that shown in FIG. 14 may be readily employed. In this case, a wire bundle retainer 95 is provided with a pair of arms 96, 98, the terminating ends of which converge towards one another to provide a relatively narrow opening 100 at the entrance to a wire receiving cavity 102 defined by the inner surfaces of arms 96, 98. As in the described embodiments, the wire bundle retainer 95 is manufactured preferably from sufficiently resilient material so that the arms 96, 98 may be deflected sufficiently to permit a bundle of wires such as 68 which have been inserted in the wire receiving cavity 102 during the fabrication of the harness to be removed therefrom merely by exerting a slight amount of pressure against the arms 96, 98 to cause them to deflect sufficiently to remove the wire bundle therefrom. Where additional wire receiving cavities such as 102 are desired on a single wire bundle retainer, a plurality of pairs of arms, such as 96, 98 may be provided in aligned disposition one above the other (not shown) to effect the desired configuration. It will also be readily apparent to those skilled in the art that the particular shape of the wire receiving cavity in any of the above described embodiments may be chosen to at least partially pre-shape the finished wire bundle. For example, in the configuration illustrated in FIG. 9, the wire receiving cavities 88, 90 are generally elliptically contoured causing the confined wires to more closely approximate a circular configuration, whereas where a less confining wire receiving cavity contour is employed, the wires will tend to spread to a greater degree than would be the case in the embodiment illustrated in FIG. 9. Thus, in a similar manner, the wire bundle retainer may be provided with a relatively narrow slit-like wire receiving cavity where an essentially flat cable arrangement is desired.

To facilitate the insertion of the supporting posts described above, into, for example, a wooden supporting member, such post may be fabricated from metal or a fairly rigid plastic material capable of withstanding a hammer blow or the like for insertion into the supporting member. Alternatively, a softer plastic may be employed for the fabrication of the support post where, for example, the post is arranged to be fastened to the supporting member by the employment of apertured flanges or an adhesive base mounting or the like (not shown).

I claim:
1. A wire guide assembly comprising: a support post having a first end and a second end; a wire bundle retainer pivotally coupled to said support post generally adjacent said support post first end and selectively recessed to provide a first arm and a second arm arranged in spaced relationship with respect to one another so as to form a wire bundle receiving cavity therebetween, said wire bundle receiving cavity opening to a first edge of said wire bundle retainer, said wire bundle retainer having a center of gravity axially offset from the location of the pivot coupling between said wire bundle retainer and said support post so that said wire bundle retainer is free to rotate to a first given position when said support post is oriented in a vertical position; and stop means selectively located on said wire bundle retainer so as to cooperate with said support means to limit the arc of rotation of said wire bundle retainer between said first given position and a second given position.
2. A wire guide assembly as defined in claim 1 wherein a bisector of said wire bundle receiving cavity is oriented substantially normal to the longitudinal axis of said support post when said wire bundle retainer is disposed in said first given position.
3. A wire guide assembly as defined in claim 1 wherein said wire bundle retainer has a selectively proportioned notched portion extending between a second edge of said wire bundle retainer and a pivot pin receiving aperture extending transversely through said wire bundle retainer.
4. A wire guide assembly as defined in claim 3 wherein said support post has a bifurcated portion at least adjacent said first end thereof, said wire bundle retainer being pivotally coupled to said support post in such manner as to selectively rotate within said bifurcated portion.

5. A wire guide assembly as defined in claim 1 wherein said wire bundle retainer has a first selectively proportioned notched portion extending between a second edge of said wire bundle retainer and a pivot pin receiving aperture extending transversely through said wire bundle retainer, and a second selectively proportioned notched portion extending a predetermined distance in a predetermined arc from said pivot pin receiving aperture toward said wire bundle receiving cavity, whereby the pivot point of said wire bundle retainer may be selectively varied.

6. A wire guide assembly as defined in claim 1 wherein said stop means comprises a raised portion extending outwardly from at least one side of said wire bundle retainer to contact said support post when said wire bundle retainer is in said first given position.

7. A wire guide assembly as defined in claim 1 wherein said wire bundle retainer further comprises a third arm disposed intermediate said first arm and said second arm to provide a further wire bundle receiving cavity.

8. A wire guide assembly as defined in claim 1 wherein said support post comprises pin means located remote from said first end thereof, said wire bundle retainer having a notch one end of which opens to an edge of said wire bundle retainer remote from said first edge thereof, said notch having a width proportioned to freely accept said pin means along the length thereof, said pin means abutting the closed end of said notch when said wire bundle retainer is in said first given position.

9. A wire guide assembly as defined in claim 8 further comprising lock means cooperative with said pin means to maintain said wire bundle retainer in said first given position.

10. A wire guide assembly as defined in claim 9 wherein said lock means comprises at least one protuberance extending into and restricting the width of said notch at a predetermined location selectively spaced from the closed end of said notch so that said pin means is releasably engaged in said notch between said protuberance and the closed end of said notch when said wire bundle retainer is in said first given position.

11. A wire guide assembly as defined in claim 1 wherein said wire bundle retainer is planarly rotatable through at least ninety degrees of arc from said first given position to said second given position.

12. A wire guide assembly as defined in claim 1 wherein said center of gravity of said wire bundle retainer is so located with respect to said point of coupling between said wire bundle retainer and said support post as to be offset from the longitudinal axis of said support post throughout at least ninety degrees of a predetermined arc of rotation of said wire bundle retainer.

13. A wire guide assembly as defined in claim 1 wherein said support post second end is arranged to be fastened to a supporting member.

14. A wire guide assembly as defined in claim 13 wherein said support post second end terminates in a sharpened point.

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