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TRENCH HEADER DUCTS

Filed Sept. 19, 1962

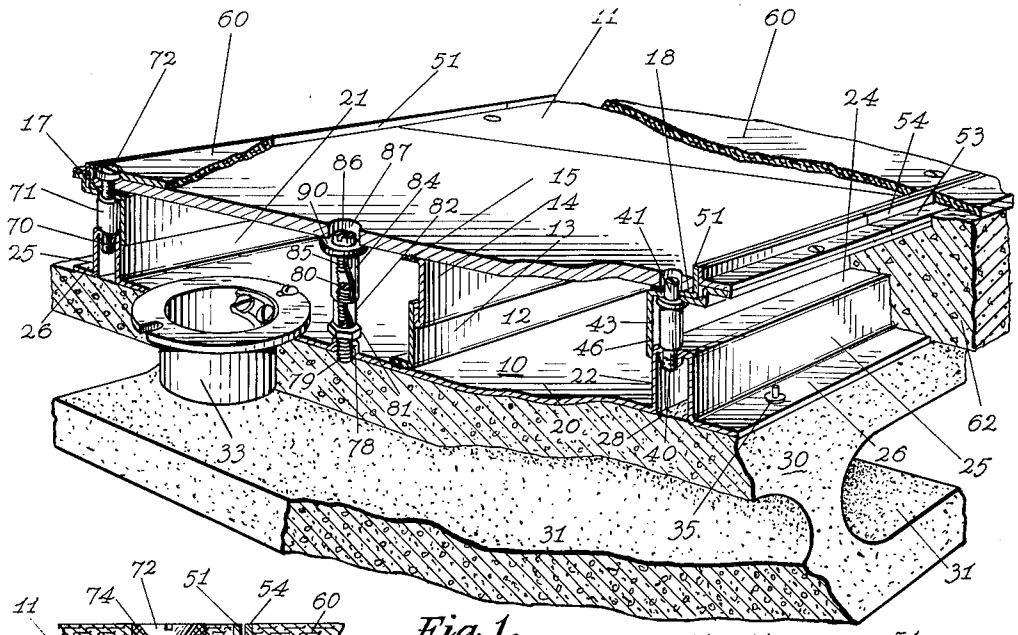


Fig. 1.

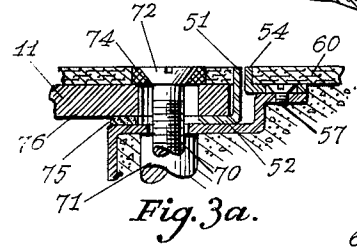


Fig. 3a.

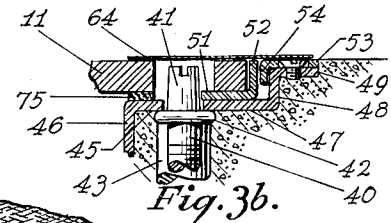


Fig. 3b.

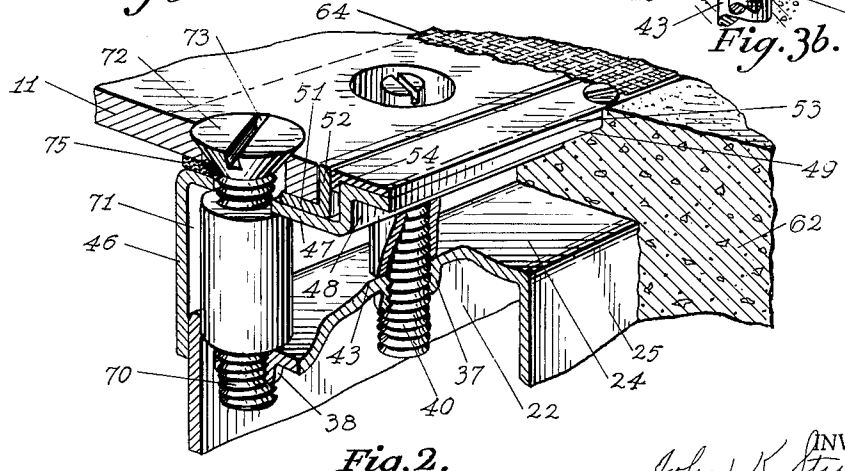


Fig. 2.

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TRENCH HEADER DUCTS

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This invention relates to trench header ducts, and more particularly to floor supported trench header ducts for accommodating electrical wiring.

In multi-floor buildings it is desirable to provide ducts for accommodating the multiplicity of electric wires (and possibly other things) which modern buildings require. Such ducts have covers which should at all times be removable for access to the duct interior. For example, power outlets and telephone outlets may have to be changed frequently in office buildings with changes in layouts.

Prefabricated ducts for such wiring are usually made of sheet metal such as steel or aluminum and during building construction are laid upon a sub-floor. Such ducts come in various widths and are provided with removable covers. After a duct has been installed, concrete fill is provided over the sub-floor so that the fill level is flush with the surface of the duct cover. This fill level is further raised by a decorative finishing floor material such as tile, wood, carpeting or the like. The finishing floor material is applied over fill and duct covers in such a way that the duct covers can still be removed without damage to the finishing material. This means, therefore, that the floor finishing material covering the duct covers must be physically separate from the remainder of the floor finishing material.

In connection with the pouring of concrete fill and rough finishing of the fill surface to be flush with the duct cover, practical difficulties have arisen. These difficulties are based upon the fact that after a duct has been installed on the sub-floor and prior to the final installation of floor finishing material over fill and duct covers, the duct work and particularly the top metal edges are exposed to abuse. The border separating the duct cover from the rest of the floor finishing material is generally defined by the dividing edges of metal strip forming part of the duct hardware. These edges are flush with the surface of the floor finishing material. For the sake of appearance, as well as good fit, it is important to protect the dividing edges from abuse and damage.

In addition to the above, it is important that the joint between the duct cover and duct proper be waterproof to prevent entry of water into the installed duct. As an example, if vinyl floor tiles are used as floor finishing material, it is to be expected that such a floor will be washed with a wet mop. It is important that liquid be prevented from entering the duct through the cover joints.

The present invention provides a simple, easily fabricated and easily installed, and generally foolproof duct construction.

For a full disclosure of the invention, reference will now be made to the following description in conjunction with the drawing wherein:

FIGURE 1 is a perspective view with parts broken away, illustrating a duct embodying the present invention installed on a sub-floor, provided with concrete fill and a floor finishing material.

FIGURE 2 is an enlarged perspective view of a portion of the duct illustrated in FIGURE 1, with certain duct parts in temporary position prior to the application of the finishing floor material.

FIGURE 3*a* is a detail, partly in section, showing an enlarged view of parts of the duct as finally installed in FIGURE 1, including a hold-down bolt.

FIGURE 3*b* is a detail, partly in section, showing an enlarged view of duct parts positioned as in FIGURE 2, including a hold-up bolt.

Referring now to the drawings, the new duct embodying the invention comprises a duct body, generally indicated by **10**, and a duct cover, generally indicated by **11**. Duct body **10** is made of sheet metal such as iron, steel or aluminum, or any other desired material. Duct body **10** can be as wide as desired. If duct body **10** is unusually wide, it is desirable to provide at least one reinforcing partition **12** extending lengthwise of the duct. As illustrated in FIGURE 1, partition **12** includes bottom angle iron portion **13** which may be welded to bottom portion **20** of the duct. The partition also includes top portion **14** which is welded or otherwise attached to cover plate **11**. These two partition parts overlap and will provide complete separation even though there may be some variations in duct depth.

Cover **11** can rest loosely upon supporting flange **15** of the partition, although it can also be bolted thereto, and extends laterally of the duct to be supported along side rail portions **17** and **18** of the duct, to be described in detail. Cover **11** should be heavy enough to carry any normal floor load when functioning as part of a floor and should also be heavy enough to withstand the handling incident to removal and handling of the cover. The remainder of the duct including the rails rests upon concrete and does not have to be very strong.

Duct body **10** comprises bottom portion **20** having upstanding inner sides **21** and **22** extending for a part of the depth of the duct. Since the sides of the duct are similar, only one need be described in detail. Referring for example to one duct side, the duct material extends from bottom **20** to provide an inverted U-shaped side wall extending for part of the duct depth. The inverter U-shaped side wall has inner side wall **21**, flat shelf **24**, after which the duct material drops to form outer side wall **25**, terminating in mounting flange **26** bent substantially at right angles to outer side wall **25**. Inner side wall **22** and outer side wall **25** are generally parallel to each other and mounting flange **26** is preferably in the same plane as bottom **20** of the duct. The duct body and sides are disposed on top surface **28** of a sub-floor of any material as steel. Concrete slabs having passages lengthwise thereof are useful with such ducts.

As illustrated here, the sub-floor is of concrete slabs **30** with passages **31** which would normally extend at right angles to the direction of the duct. Thus a sub-floor could consist of a number of hollow slabs disposed in side-by-side relation with passages extending in one direction and duct work extending along the surface of the slabs generally perpendicular to the direction of the slab passages. As illustrated here, one or more metal grommets **33** can be provided for connecting slab passageway **31** with the interior of a duct so that wires or other material can extend or pass between a slab passage and a duct. Duct body **10** does not require sturdy attaching means to sub-floor **30** since, as will be shown later, the weight of concrete fill will anchor the duct body in position. However, it is necessary to provide adequate anchorage of duct body **10** to sub-floor **30** pending the completion of the concrete fill. Accordingly, mounting flange **26** of the duct body is used for anchoring the same to the concrete or other sub-floor. To this end, there is shown nail **35** for securing mounting flange **26** in position upon sub-floor **30**. This nail or other desired fastening means can be provided at any desired intervals along both mounting flanges on

the two sides of the duct body. The mounting flange can be apertured or provided with threaded extrusions at intervals for mounting purposes or hardened nails can be driven through the flange where desired.

Shelf **24** along each side of the duct body provides support for the side rail structures previously referred to generally as **17** and **18**. To this end, shelf **24** is provided at intervals along the length of the duct body with pairs of sleeve-like extrusions **37** and **38**. These extrusions can extend above or below shelf **24** and are provided to accommodate threaded bolts. The sleeve-like extrusions may either be pre-threaded or the bolts may be of the self-tapping type which can cut their own threads. Sleeve-like extrusion **37** can be used for accommodating a hold-up bolt while sleeve-like extrusion **38** will accommodate a hold-down bolt.

Referring to extrusion **37**, this has threaded into it hold-up bolt **40** (FIGURES 2 and 3*b*) having slotted head **41** and provided with collar or washer portion **42**. Disposed around bolt body **40** is flexible sleeve protector **43** of rubber, paper or the like. Sleeve protector **43** of the hold-up bolt extends between the top surface of shelf **24** and the bottom of collar portion **42** of the bolt. Sleeve **43** is provided to prevent concrete from rising to an undesired level about the bolt. This sleeve may be omitted if desired, since collar **42** with the metal above the collar, as illustrated in FIGURE 3*b*, will generally suffice to keep concrete mixture from going up into an undesired region.

Temporarily supported in spaced relation above shelf **24** by collars **42** of the various hold-up bolts **40** along each side of the duct body are the rail structures. Each rail structure includes Z bar portion **45** and duct side wall flange portion **46**. Z bar portion **45** has body **47**, rail portion **48** and rail flange **49**. Body **47** of the Z bar portion is apertured to permit passage of bolt head **41** of each hold-up bolt **40**, the apertures, however, being small enough so that collar portion **42** of the hold-up bolt can engage the bottom of body **47** and thus support the rail at a desired elevation above shelf **24**. The elevation of rail **45** above shelf **24** can be controlled by adjustment of each bolt **40** in its extrusion **37**. Insofar as sleeve **43** is concerned, this can be of a predetermined maximum length somewhat greater than would be required for most purposes. The sleeve will have sufficient flexibility to yield and wrinkle when hold-up bolt **40** is adjusted to a desired position.

Supported upon the top surface of body **47** of the Z bar portion is a floating 90° inner angle strip consisting of inner tile stop flange **51** and temporary border flange **52**. This floating angle strip has the two flanges at right angles and has inner tile stop portion **51** greater in width than temporary border portion **52**. The width of each portion is the distance between the free edge of the portion and the corner where the angle is located. These dimensions can be seen on the various figures of the drawing. The floating angle strip will come in suitable lengths such as 8 feet or longer and can be of brass, aluminum or stainless steel, preferably the latter.

Rail flange **49** is provided with tapped apertures at intervals along the length of the Z bar portion and accommodates an outer 90° angle strip consisting of attaching flange **53** and outer tile stop flange **54**. This outer angle strip also comes in long lengths and may be of brass, aluminum or stainless steel, as desired. The width of attaching flange **53** of the outer angle strip is such that the angle strip can lay over rail portions **49** and **48** snugly, as illustrated in FIGURES 2 and 3*b*. In this position, outer tile stop flange **54** extends downwardly toward body **47** of the Z bar portion in space between temporary border flange **52** of the floating angle strip and rail **48**. Small bolts **57** in apertures in attaching flange **53** are used for engaging the threaded apertures in rail flange **49** to secure the two parts together. The registered apertures for bolts **57** should be evenly spaced along the rail length so that registration will occur when the angle strip is reversed, as described later.

The width of outer tile stop flange **54** of the outer angle strip is substantially equal to the thickness of finishing floor material **60** so that when the outer angle strip is reversed, as illustrated in FIGURES 1 and 3*a*, from the position shown in FIGURES 2 and 3*b*, the free edge of outer tile border flange **54** will be substantially flush with the surface of floor finishing material **60**.

Referring back to the inner floating angle strip, the width of inner tile stop flange **52** thereof is such that in the position shown in FIGURES 2 and 3*b*, the free edge of flange **52** will be flush with the top surface of cover **11** and with the free surface of attaching flange **53** of the outer angle strip. Thus in the position of the entire rail structure and duct cover as illustrated in FIGURES 2 and 3*b*, the cover and rail structure generally will be flush and concrete fill **62** can be poured into the region outside of the duct as illustrated in FIGURES 1 and 2. This concrete fill will cover duct attaching flange **26**, outer side wall **25** and shelf **24**. During trowelling of the top of the concrete fill, there will be no damage to the various metallic edges. For convenience, masking tape **64** can be applied over the cover and rail structure prior to the application of the concrete fill so that concrete will not enter the cover apertures or rail structure. The clearances between the various border portions and the cover, as illustrated in FIGURES 2, 3*a* and 3*b*, are exaggerated and, in practice, these clearances will be quite small. In fact, the screw head apertures in attaching flange **53** can be large enough to permit adjustment of the angle strip in the final position illustrated in FIGURE 3*a* to control the clearance.

Duct side wall portion **46** is wide enough to overlap part of inner side wall **22** to prevent concrete fill from entering the duct region. The floating angle strip in the position illustrated in FIGURE 3*b*, which is the position prior to the application of the floor finishing layer, will have temporary border flange **52** flush with the cover as previously pointed out. After the concrete fill has been completed and the surface prepared for the floor finishing layer, masking tape **64** will be removed. The outer angle strip is reversed so that outer tile stop flange **54** extends upwardly as shown in FIGURE 3*a*. Similarly, the inner floating angle strip is reversed so that inner tile stop flange **51** is now up, while temporary border flange **52** rests upon body **47**. Inner tile stop flange **51** of the inner floating angle strip is long enough so that flange **51** is flush with the edge of outer tile stop flange **54** and will be flush with floor finishing material **60**. It should be noted that floor finishing material **60** over cover **11** will spread or extend to flange **51**. Similarly, outer tile stop flange **54** will have the floor material abut against it so that the only clearance in this finished construction will be between flanges **51** and **54**, these now constituting the inner and outer tile stops for the floor finishing material. For convenience "tile" has been used in describing the stops. It is obvious that the floor finishing material need not necessarily be tile.

Prior to the application of concrete fill **62**, hold-down bolts **70** will be positioned in extrusions **38**. Each hold-down bolt **70** will have the threaded body of the bolt between shelf **24** and body portion **47** of the Z bar portion covered with flexible protective sleeve **71** of rubber, or the like, to keep concrete away from bolt **70** so that hold-down bolt **70** can be turned easily after the concrete fill has set. Hold-down bolt **70** has bolt head **72** in an aperture **73** in cover **11**. Aperture **73** is large enough so that bolt head **72** can be flush with cover **11** prior to the application of floor finishing material **60**. Bolt head **70** will be covered with masking tape, this also being true of the apertures in cover **11** for the heads of hold-up bolts **40**. When floor finishing layer **60** is applied, clearance openings for heads **72** of each hold-down bolt will be provided. The apertures in cover **11** for

the hold-up bolts will be covered by the floor finishing layer, since these hold-up bolts perform no function after the concrete fill has set. In order to improve the appearance of the floor finishing layer in the regions of the heads of the hold-down bolts, escutcheon washers **74** can be provided to fill the space around the bolt head. It is possible to use a hold-down bolt having an enlarged flat head type to fit snugly in a round opening in the floor finishing layer **60**.

Gasket **75** of rubber or other suitable material is provided around the peripheral portion of bottom face **76** of cover plate **11**. Gasket **75** may be cemented to body portion **47** of the modified Z bar in the position as illustrated in the drawing so that cover **11** when removed will not take the gasket with it and incur possible damage or loss.

The duct body, apart from partition **12** which can accommodate itself to variations in duct depth, is also provided with adjustable means for accommodating bottom **20** to depressions or concavities of the sub-floor surface. The levelling means to be described are provided for one or more portions of duct bottom **20** between the sides of the duct. Referring to FIGURE 1, duct bottom **20** is provided with upwardly directed extrusion **78** which is threaded and which can accommodate levelling bolt **79**. Levelling bolt **79** is slotted at **80**, but is preferably headless. Levelling bolt **79** is adjusted to the proper point where the bottom end of the bolt rests upon a solid support and is locked in this position by lock nut **81**. The exposed part of bolt **79** above lock nut **81** is covered with flexible rubber sleeve **82** to prevent abrasion of insulation of wire in the duct raceway. Engaging the top portion of bolt **79** is internally threaded metal sleeve **84** which functions as a coupling between bottom bolt **79** and top bolt **85**. Top bolt **85** is threaded into the top end of sleeve **84** and this top bolt has slotted head **86** disposed in aperture **87** in cover plate **11**. Washer **90** above sleeve **84** and below cover plate **11** is provided, this washer being larger than aperture **87** in the cover plate and thus providing support for an intermediate part of the cover plate. Preferably, washer **90** is locked by slotted head **86** of the top bolt, this slotted head being somewhat larger than the bolt body. Thus when the cover plate is removed, there will be no danger of losing the various parts. It is understood that this levelling arrangement may be provided at spaced intervals along the length or width, or both, of the duct body.

Lengths of duct are abutted at the ends. This is also true of cover **11**. Cover **11** need not necessarily come in the same lengths that the duct body comes in. As a rule, cover **11** will be of sufficiently heavy material so that it can support substantial weight. Since it must be pulled up by workmen when access to the duct interior is desired, it is preferred to have duct cover **11** come in lengths short enough so that one or two men can handle the same. As a rule, such duct covers will come in lengths of about three or four feet, although the length is not important. The duct body can come in any desired lengths. The rails may come in various lengths or may be cut to desired length. The lengths of the various angle strips, both inner and outer strips are so selected that no strip joints will be aligned across the duct. In other words, it is preferred to have inner and outer angle strips end at different places so that the strength of a rail portion along one side of the duct will be enhanced insofar as the angle strips are concerned. Similarly, it is preferred not to have any alignment of joints laterally across the duct cover. In this way the end of any one angle strip will come at a point which will not coincide insofar as lateral dimensions are concerned, with the end of any other angle strip. This can be accommodated by cutting the angle strips to desired lengths. Adjacent ends of the rails may be bolted to coupling strips for rigidity.

In connection with the designation of the angle strips as having tile stop portions, it is to be understood that the use of the word "tile" does not necessarily limit the floor covering material to tile. It is obvious that the floor covering material may be of any desired material and the designation of these angle strip portions as "tile stops" is merely for convenience of description.

What is claimed is:

1. In a prefabricated metal duct having a removable top cover and adapted for permanent installation over a subfloor with fill thereover to the level of the top of the duct cover and having floor finishing material over the duct and fill, the cover and its portion of floor finishing material being removable from the duct as a unit for access to the duct interior, said duct having a body comprising a bottom and opposed upstanding parallel side walls, each side wall receiving supporting means at each side wall comprising a rail means, a rail having a Z portion said Z portion being above the side wall, said Z portion providing a lower and upper horizontal step longitudinally of the duct, the upper steps at opposite duct sides being further apart than the lower steps, an outer angle strip having an attaching flange and an outer floor finish material stop flange, threaded means detachably securing said outer angle strip attaching flange along the top surface of said upper step in face to face relation in either of two positions so that said stop flange extends downwardly or upwardly of the upper step, the stop flange in either strip position being located along the region where the Z portion drops from the upper step to the lower step, a floating inner angle strip having a temporary border flange and a wider floor finish stop flange, said two flanges being of equal thickness, said inner angle strip being supported along the lower Z portion step by having one flange face resting against the Z portion step and the remaining flange extend vertically upward adjacent the Z portion drop; the inner angle strips on opposite duct sides having their support flanges extend toward each other, each inner angle strip having each of its flanges narrow enough so that in either position, the support flange for each inner angle strip will not cover all of the Z portion lower step but will leave a free gasket accommodating longitudinal region adjacent the free edge of the inner angle support flange, gaskets for said longitudinal free regions on said Z portion lower steps, a cover of suitable width supported on said inner angle strip support flanges with the gaskets providing a seal between the cover and Z portion lower steps, said cover extending transversely of the duct length snugly between the opposed faces of the upwardly extending flanges of the inner angle strips, the top faces of said outer angle strip mounting flanges normally being level with the top surface of the duct cover; in a temporary position, each outer angle strip stop flange extending downwardly and the inner angle strip having its temporary border flange extending upwardly away from the Z portion lower step with the flange edge level with the top of the duct cover whereby floor fill can be applied up to the free edges of said outer angle strip mounting flanges and level with the top faces of said mounting flanges without danger of damage to permanently exposed flange edges of both inner and outer angle strips; said inner and outer angle strips, after reversal from temporary positions to final positions, providing stop flanges for floor finishing material applied to the cover and over the top faces of said outer angle strip mounting flanges, the outer angle strips and their stop flanges remaining fixed to protect the adjacent edges of floor finishing material when the cover is moved, said inner angle strips functioning similarly for the cover floor finish material, said construction providing for use of conventional right angle metal strip for both inner and outer angle strips, the clearance between the opposed flange faces of the two angle strips being the same in temporary or final angle strip positions and the gap in the floor finishing

material longitudinally of the cover being minimized substantially to the thicknesses of opposed flanges plus clearance therebetween.

2. The structure according to claim 1 wherein said rail means are adjustably supported on said duct side wall by hold-up bolts disposed at spaced intervals along the length of said rail means, each hold-up bolt having a threaded portion threadably engaging a portion of the duct side wall, each hold-up bolt having shoulder means disposed below the lower step of the Z portion of the rail means and having the head of such hold-up bolt accessible through an opening in said lower step, whereby said rail means may be levelled after installation of said duct on said sub-floor but prior to the application of floor fill, said rail means being adapted to have floor fill applied below the steps thereof, after which said rail means is permanently supported by said fill, said shoulder means also functioning to seal the opening in said lower step against entry of floor fill material above said steps while permitting access from above said step to turn said bolt, said hold-up bolts and the outer angle strip threaded means being completely independent of each other so that said outer angle strips can be adjusted or reversed without interference from hold-up bolts.

3. The construction according to claim 2 wherein the duct body includes a bottom wall for the duct, the metal for the bottom wall extending upwardly for part of the duct depth to form part of the side wall structure on each side of the duct, said upwardly extending portion then being shaped to extend laterally outwardly and then downwardly to provide an inverted U with a laterally extending duct mounting flange extending away from the duct body, said duct mounting flange on each side adapted to provide temporary attachment of the duct to the sub-floor pending the application of floor fill, said hold-up bolt means having the threaded portion thereof extending vertically through the bight of the inverted U with the threaded portion of said hold-up bolt below said bight being located in empty space between the sides of the inverted U, said rail means having a side wall flange portion extending downwardly from the lower step of the Z portion in overlapping, abutting engagement with the inner face of the inverted U thus preventing floor fill material from entering the duct, the floor fill material being applied in the space above the duct mounting flange and the accessible outer surfaces of the inverted U and duct side wall flange portion carried by said rail means, said inner angle strip being at all times free of all bolts so that it may be reversed without disturbing the setting of any bolt.

References Cited by the Examiner

UNITED STATES PATENTS

1,898,087	2/33	Fullman	50—127
2,036,054	3/36	Knap	50—127
2,348,416	5/44	Posey	50—80
3,029,964	4/62	Hudson et al.	50—127
3,061,663	10/62	Reiland	50—127
3,074,208	1/63	Seidel	50—127
3,101,097	8/63	Murray	50—127

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