Sept. 28, 1971 W. J. BERCHOU ET AL 3,608,442

SEALING MEMBER

Filed Sept. 10, 1969

Fig. 1.

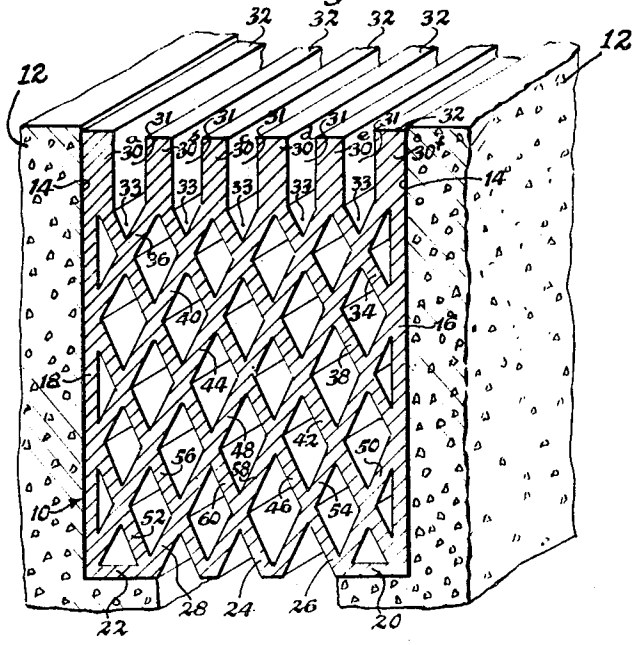


Fig. 2.

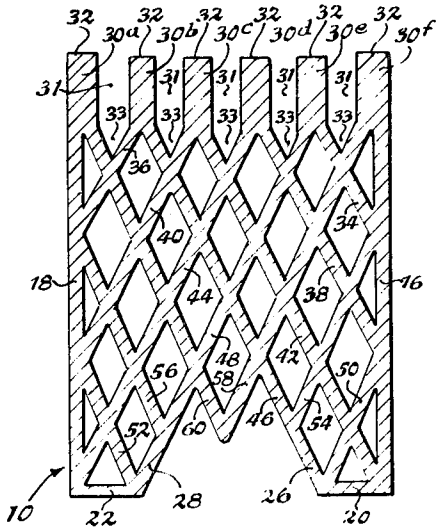


Fig. 3.

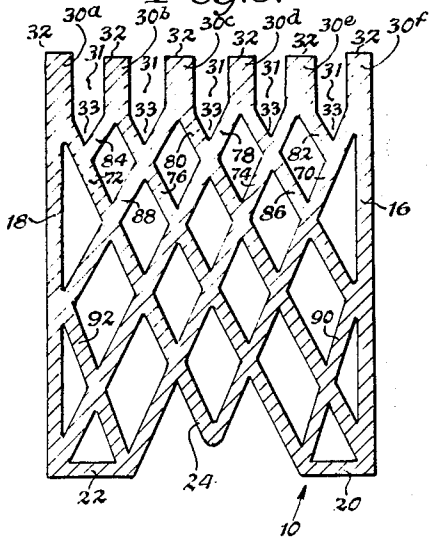
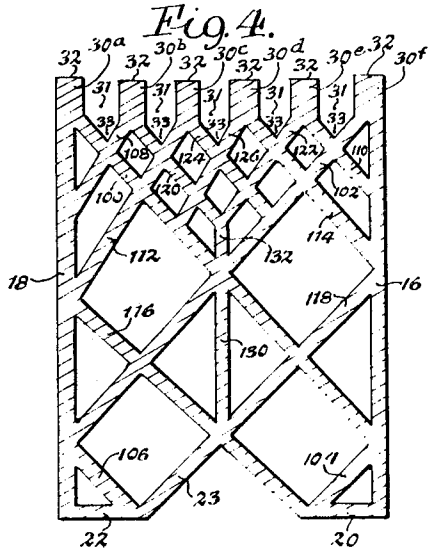


Fig. 4.



INVENTORS
WILLIAM J. BERCHOU
AND
FREEL F. BRYAN

BY Christel & Bean
ATTORNEYS

United States Patent Office 3,608,442 Patented Sept. 28, 1971

3,608,442

SEALING MEMBER

William J. Berchou, Buffalo, and Freel F. Bryan, Williamsville, N.Y., assignors to Acme Highway Products Corporation, Buffalo, N.Y.

Filed Sept. 10, 1969, Ser. No. 856,770
Int. Cl. E01c 11/10
U.S. Cl. 94—18 7 Claims

ABSTRACT OF THE DISCLOSURE

An elongated resilient sealing member comprising side walls, a bottom wall and a series of elongated tread membtrs constituting a top wall. The interior of the seal is provided with a plurality of interconnected cross bars formed integrally with the walls to provide an internal truss structure. Spaces are provided between the tread members to allow movement of the tread members into such spaces during lateral compression of the side walls. In a preferred form the spacing between adjacent tread members approximates or exceeds the width of the tread members, and each intermediate tread member is connected to a pair of downwardly diverging cross bars each having a width approximately one-half that of the tread member.

BACKGROUND OF THE INVENTION

This invention relates to sealing means, and, more particularly, to sealing members employed in expansion joints which are disposed in grooves formed between adjacent blocks or slabs of concrete or other building material.

Grooves are conventionally provided in pavements at intervals lengthwise thereof between pavement slabs which are exposed to variations in temperature to accommodate expansion and contraction of the material of which the pavement is formed. These grooves must be sealed to prevent water and other deleterious liquid and solid materials from passing into the grooves, and in some cases from passing through the grooves beneath the pavement. Generally, these grooves are sealed by means of hollow, resilient, elastomer strips which can be compressed when the groove is contracted due to expansion of the pavement material and which expand to effectively seal the groove when the same is expanded due to contraction of the pavement material.

It is desirable to prevent upward bulging of the top wall of the seal above the level of the pavement since this contributes to failure of the seal from traffic impact. Therefore, the seals normally are so designed that when the seal is compressed, the upper surface of the seal tends to be drawn downwardly into a buckling internal truss arrangement formed in the seal leaving the upper surface somewhat recessed. In some designs, the top wall converges downwardly to form a depressed middle portion prior to being compressed and is further depressed upon compression to positively avoid any portion of the seal extending above the top surface of the adjacent blocks or slabs.

Such seal arrangements are for vehicle traffic. However, a problem arises when such seals are disposed in grooves formed in sidewalks and other architectural concourses subjected to pedestrian traffic, because the recessed top wall of the seal can present a hazardous condition to such pedestrian traffic. Therefore, it is desirable to provide a tread surface on the seal which remains substantially planar during compression and expansion of the seal, which never projects above the pavement surface, and which remains very closely adjacent the pavement surface under all conditions.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a new and improved seal particularly adapted for pedestrian traffic.

It is another object of this invention to provide an improved seal having wear tread means and an internal truss arrangement to maintain the upper surface of said tread means substantially level during compression and expansion of the seal.

It is still another object of the present invention to provide such a seal with means precluding bulging of the seal above the top surfaces of adjacent pavement slabs while avoiding undesirable depressions between such slabs.

Generally speaking, the seal of the present invention, as hereinafter described, comprises a pair of side walls, a bottom wall and tread members constituting a top wall. Interconnected, diagonally extending cross bars are provided within the confines of the walls and are integrally formed therewith to provide an internal truss structure. The tread members project upwardly with the upper edges thereof forming wear surfaces. Spaces of substantial width relative to the width of the tread members are provided between the tread members to permit substantial compression of the sealing member and accommodate the accompanying lateral movement of the tread members for maintaining the upper wear surfaces of the tread members substantially level.

The foregoing and other objects, advantages and characterizing features of the present invention will become clearly apparent from the ensuing detailed description of certain illustrative embodiments thereof, taken together with the accompanying drawings wherein like reference numerals denote like parts throughout the various views.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a perspective, transverse sectional view of a sealing member of the present invention, broken away to indicate an indeterminate length, shown inserted in a groove formed between adjacent pavement slabs;

FIG. 2 is a transverse sectional view of another form of a sealing member of this invention;

FIG. 3 is a transverse sectional view of a third form of a sealing member of this invention; and

FIG. 4 is a transverse sectional view of a fourth form of a sealing member of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, and particularly to FIG. 1, there is shown an elongated sealing member, generally designated **10**, inserted in a groove formed between adjacent slabs of pavement **12**. The insertion of sealing member **10** into such groove is facilitated by the application to the side of the groove of a suitable lubricant-adhesive **14** which, when set, cements sealing member **10** in place. Sealing member **10** is expansible and contractable in width in accordance with variations in the width of the groove due to contraction and expansion of pavement slabs **12**. Sealing member **10** is preferably composed of a resilient elastomeric material, such as neoprene for example, or any other elastic material having similar properties of durability, sufficient compression and expansion capabilities, high abrasion resistance and capable of withstanding temperature extremes, sunlight, weathering, and oxidation. Sealing member **10** is formed of a unitary, one-piece construction and can take various outside dimensions to conform to the widths of the grooves in which it is used and can be of any length to accommodate varying widths of pavements. Moreover, although the sealing member of this invention is particularly adapted for sidewalks and

architectural concourses subjected to pedestrian traffic, it should be understood that such sealing member is in no manner limited to such use and has general utility in various expansion joint applications.

Sealing member **10** comprises side walls **16** and **18** which are substantially parallel and straight from end to end. The lower edges of side walls **16** and **18** are connected to foot portions **20** and **22** extending substantially horizontally inwardly from side walls **16** and **18**. Horizontal portions **16** and **18** are connected to an intermediate W-shaped portion **24** by means of ribs **26** and **28** which extend upwardly at an angle in converging relation. Portions **20**, **22**, **24**, **26** and **28** constitute the bottom wall of sealing member **10**. A series of spaced, upwardly directed projections or tread members **30** extend longitudinally of sealing member **10** and are provided with spaces **31** therebetween to permit lateral movement of said tread members **30** when side walls **16** and **18** are pressed toward each other during compression to avoid upward bulging movement of tread members **30** above the top surfaces of adjacent pavement slabs **12**. Tread members **30** constitute the top wall of sealing member **10** and the upper ends of said tread members **30** form wear surfaces **32**. Although tread members **30** are identical and have the same linear and width dimensions, they are indicated with suffix letters as shown in FIG. 1 as **30***a*, **30***b*, **30***c*, **30***d*, **30***e* and **30***f* for convenience in describing their relation with the internal truss structure, described below.

The interior of sealing member **10** is provided with an internal truss structure comprising a plurality of diagonally extending cross bars formed integral with the top, bottom and side walls and having spaces therebetween into which said cross bars can fold when said side walls **16** and **18** are laterally compressed. These cross bars include a pair of short cross bars **34** and **36** which extend upwardly at an angle in converging relation from opposite side walls **16** and **18** to the lower ends of tread members **30***e* and **30***b*. A pair of longer cross bars **38** and **40**, parallel to bars **34** and **36**, extend upwardly at an angle in converging relation from opposite side walls **16** and **18** to the lower ends of tread members **30***d* and **30***c*. A pair of long cross bars **42** and **44**, parallel to bars **38** and **40**, extend upwardly at an angle from the bottom intersections or corners of side wall **16** and portion **20** and side wall **18** and portion **22**, respectively, to the lower ends of tread members **30***c* and **30***d*. Cross bars **42** and **44** intersect adjacent their upper ends near tread members **30***c* and **30***d*. Another pair of long cross bars **46** and **48**, parallel to bars **42** and **44**, extend upwardly at an angle from the inner ends of portions **20** and **22** to the lower ends of tread members **30***b* and **30***e*. Cross bars **46** and **48** are aligned with and form extensions of ribs **26** and **28** and intersect intermediate their opposite ends. A pair of short cross bars **50** and **52** extend upwardly at an angle in diverging relation from the inner ends of portions **20** and **22** to side walls **16** and **18** adjacent the lower ends of bars **38** and **40**. A pair of longer cross bars **54** and **56**, parallel to bars **50** and **52**, extend upwardly at an angle in diverging relation from portion **24** to side walls **16** and **18** adjacent the lower ends of bars **34** and **36**. A pair of long cross bars **58** and **60**, parallel to bars **54** and **56**, extend upwardly at an angle in diverging relation from portion **24** to the lower ends of tread members **30***f* and **30***a*.

The various cross bars form a cross sectional mesh configuration defining a plurality of diamond shaped spaces internally of side walls **16** and **18** and a plurality of triangular shaped spaces adjacent the inner surfaces of side walls **16** and **18** and foot portions **20** and **22**. These cross bars have widths approximately and preferably no greater than one-half the width of tread members **30** and are coextensive with sealing member **10**.

A significant feature of the present invention is the provision of a relatively large number of tread members **30** having relatively wide spaces therebetween to accommodate substantial lateral movement of said tread members **30** and maintain a suitable tread surface during lateral compression of sealing member **10**. It is important that tread members **30** do not bulge upwardly above the upper horizontal surfaces of pavement slabs **12** during lateral compression of side walls **16** and **18**. The sealing member is positioned in the groove with the wear surfaces of the outermost tread members no higher than and preferably slightly below the horizontal surfaces of the adjacent slabs **12**, as shown in FIG. 1. Since the side walls **16**, **18** are cemented to the adjacent pavement slabs, outer tread members **30***a* and **30***f* will not rise during compression of the seal. To allow for the slight upward movement of tread members **30***b*, **30***c*, **30***d* and **30***e* which is inherent upon movement of the diagonally extending cross bars into the adjacent spaces during lateral compression of sealing member **10**, their upper wear surfaces **32** are positioned slightly below the upper wear surfaces of tread members **30***a*, **30***f*. A spacing on the order of ⅛ inch is sufficient to preclude such wear surfaces from rising above the outer tread member wear surfaces when the seal is fully compressed. Moreover, triangular V-shaped grooves **33** are provided between adjacent tread members to aid in directing and influencing movement of the upper portions of sealing member **10** to preclude any substantial upward bulging thereof. Also, it is a feature of this invention that as tread members **30** rise this slight distance they move uniformly to maintain wear surfaces **32** level in a horizontal plane. Thus, spaces **31** and V-shaped grooves **33** preclude substantial upward bulging movement of tread members **30** while permitting laterally inward movement thereof to maintain upper wear surfaces **32** level and substantially planar.

With the exception of the two outermost tread members **30**, the lower end of each tread member is connected to a pair of diverging cross bars which terminate either at one of the side walls or at the bottom wall to transmit downward compressive forces acting on wear surfaces **32** of tread members **30** into component forces acting against the side walls and the bottom wall. Such diverging bars also serve to reinforce and support said tread members against downward compressive forces. The lower ends of the outermost tread members **30***a* and **30***f* are connected to one diagonal cross bar and the respective side wall to resist downward compressive forces.

The provision of cross bars of a width no greater than ½ the width of the tread members, in the diagonal arrangement shown, permits full compression of the sealing member with the tread members abutting. The spaces **31** between adjacent tread members **30** have a width approximately and preferably somewhat greater than that of the tread members. For example, the spacing can exceed the tread member width by 20% in a preferred form. The subdividing of the seal tread surface in this manner provides an adequate number of properly supported tread members in a seal capable of a substantial amount of compression and expansion.

FIG. 2 illustrates another form of the invention similar to the form shown in FIG. 1 with the exception that bottom wall W-shaped portion **24** is deleted. The other structural features of the form shown in FIG. 1 and their attendant functions are duplicated in the second form of the invention and the same reference characters are used to identify similar elements. By eliminating portion **24**, less resistance is encountered in influencing the internal structure of sealing member **10** downwardly. Also, less material is utilized, reducing costs.

FIG. 3 illustrates a third form of a sealing member of this invention wherein the internal truss structure is even simpler, easier to fabricate and less expensive than the form of FIGS. 1 and 2. In FIG. 3, seal **10** comprises side walls **16** and **18**, a bottom wall comprised of horizontally inwardly extending foot portions **20**, **22** and an inverted W-shaped portion **24**, and a top wall comprised of upwardly extending projections or tread members **30**. Spaces

31 are provided between tread members 30 and terminate in V-shaped grooves 33 in a construction similar to that described in connection with FIGS. 1 and 2. Tread members 30 are individually identified as 30*a*, 30*b*, 30*c*, 30*d*, 30*e* and 30*f*.

The interior of sealing member 10 is provided with an internal truss structure comprising a plurality of diagonally extending cross bars formed integral with the top, bottom and side walls and having spaces therebetween into which such cross bars can collapse when side walls 16 and 18 are laterally compressed. These cross bars include a pair of cross bars 70 and 72 extending downwardly at an angle in converging relation from tread members 30*f* and 30*a* to portion 24. A second pair of cross bars 74 and 76, parallel to cross bars 70 and 72, extend downwardly at an angle from tread members 30*e* and 30*b* to the inner ends of portions 22 and 20. Cross bars 74 and 76 intersect intermediate their opposite ends. A third pair of cross bars 78 and 80, parallel to cross bars 74 and 76 extend downwardly at an angle from tread members 30*d* and 30*c* to the corners formed by side wall 18 with foot portion 22 and side wall 16 with foot portion 20, respectively. Cross bars 78 and 80 intersect adjacent their upper ends near tread members 30*c* and 30*d*. A pair of short cross bars 82 and 84 extend downwardly at an angle in diverging relation from tread members 30*e* and 30*b* to cross bars 70 and 72. A pair of longer cross bars 86 and 88 parallel to bars 82 and 84, extend downwardly at an angle in diverging relation from tread members 30*d* and 30*c* to the vertical midsections of side walls 16 and 18. Another pair of cross bars 90 and 92 extend from the vertical midsections of side walls 16 and 18 adjacent the lower ends of cross bars 86 and 88 downwardly at an angle to the inner ends of foot portions 20 and 22. Sealing member 10 has the advantage of utilizing less material and can be more easily fabricated to render it less expensive than the sealing members shown in FIGS. 1 and 2. The relation between tread member width and spacing, and of cross bar width to tread member width remains as described in FIG. 1.

FIG. 4 illustrates still another form of the present invention comprising a pair of side walls 16 and 18, a bottom wall comprised of inwardly extending foot portions 20 and 22 connected to an inverted V-shaped middle portion 23, and a top wall comprised of a series of tread members 30 having spaces 31 therebetween which terminate in V-shaped grooves 33. As before, tread members 30 are individually identified as 30*a*, 30*b*, 30*c*, 30*d*, 30*e* and 30*f*.

The internal truss structure comprises a pair of intersecting cross bars 100 and 102 which extend from the lower ends of tread members 30*a* and 30*f* downwardly at an angle to side walls 16 and 18, the bars 100 and 102 intersecting intermediate their opposite ends. A short pair of lower bars 104 and 106 extend from side walls 16 and 18 adjacent the lower ends of bars 100 and 102 downwardly at an angle in converging relation to the inner ends of foot portions 20 and 22. A short pair of upper bars 108 and 110 extend from the lower ends of tread members 30*b* and 30*e* downwardly at an angle in diverging relation to side walls 18 and 16. A longer pair of bars 112 and 114 extend from the lower ends of tread members 30*c* and 30*d* downwardly at an angle in diverging relation to the vertical midsections of side walls 18 and 16. A pair of cross bars 116 and 118 extend from the vertical midsections of side walls 18 and 16 adjacent the lower ends of bars 112 and 114 downwardly at an angle to the inner ends of foot portions 20 and 22. Bars 116 and 118 intersect adjacent their respective lower ends. A pair of bars 120 and 122 extend from the lower ends of tread members 30*b* and 30*e* downwardly at an angle in converging relation and meet at their lower ends above the interection of bars 100 and 102. A pair of bars 124 and 126 extend from the lower ends of tread members 30*c* and 30*d* downwardly at an angle and terminate at intersecting bars 102 and 100. The relation between tread member width and spacing, and between cross bar and tread member width is as set forth in connection with FIG. 1.

A first intermediate upright wall 130 is arranged approximately midway of side walls 16 and 18 in substantial parallelism therewith and extends from the intersection of cross bars 116 and 118 upwardly to the intersection of cross bars 100 and 102. Intermediate wall 130 divides the internal truss structure into two groups thereby providing substantially uniform action of both groups and distributes the expansion of seal 10 so that outward pressures exerted by the intersecting cross bars will be substantially equally applied to both side walls 16 and 18. Also, intermediate wall 130 offers support to cross bars 100, 102, 116 and 118.

A second intermediate upright wall 132 is disposed immediately above wall 130 in substantial vertical alignment therewith and extends from the intersection of cross bars 100 and 102 upwardly to the juncture of the lower ends of bars 120 and 122. Intermediate wall 132 offers support to cross bars 100, 102, 120 and 122.

Intermediate walls 130 and 132 are vertically alined with the space 31 between tread members 30*c* and 30*d*, and are no wider than and preferably narrower than that space, whereby they do not interfere with compression of the seal member upon expansion of the pavement.

As shown in FIG. 4, intersecting cross bars 100 and 102 divide the upper central portion of sealing member 10 into a triangular space which accommodates a series of short interconnecting cross bars forming a plurality of spaces smaller than the spaces formed by the cross bars located exteriorly of such triangular space. With such an arrangement, additional reinforcement and support is provided in sealing member 10 where it is most needed, namely the upper central portion of sealing member 10, to resist downward compresive forces acting on the upper center portion thereof and thereby preclude uneven downward movement of tread members 30.

It should be understood that while only vertical sections are shown in FIGS. 2–4, the sealing members depicted in these figures also are elongated and the various walls and cross bars are coextensive with their respective seals.

From the foregoing, it is apparent that the present invention fully accomplishes its intended objects and provides an improved sealing member, offering substantial contraction capability and having wear tread members, the upper wear surfaces of which remain substantially level during expansion and compression of the sealing member and which do not rise above the upper surfaces of adjacent pavement slabs during compression.

Selected examples of this invention having been described, it is to be understood that this has been done by way of illustration only.

We claim:

1. A sealing member comprising: an elastic body member having a pair of side walls, a bottom wall, laterally spaced tread members constituting a top wall, and a plurality of interconnected cross bars forming an internal supporting truss structure, said tread members having wear surfaces and including a tread member along each side of said sealing member and at least one tread member therebetween, the spaces between adjacent tread members having a width approximately that of said tread members, wherein there are at least two tread members between said side tread members and the latter project slightly above the former in the uncompressed state of said sealing member.

2. A sealing member according to claim 1 wherein said internal truss structure includes interconnected cross bars extending diagonally from said tread members and having spaces therebetween permitting said diagonally

extending cross bars to collapse into said last-named spaces when said side walls are laterally compressed.

3. A sealing member according to claim 1 wherein some of said cross bars of said internal truss structure connect said tread members with said side walls and others of said cross bars connect said tread members with said bottom wall.

4. A sealing member comprising: an elastic body member having a pair of side walls, a bottom wall, laterally spaced thread members constituting a top wall, and a plurality of interconnected cross bars forming an internal supporting truss structure, said tread members having wear surfaces and including a tread member along each side of said sealing member and at least one tread member therebetween; the spaces between adjacent tread members having a width approximating that of said tread members, wherein each of said tread members has a lower end connected to at least one cross bar extending downwardly at an angle relative to the wear surface of said tread member.

5. A sealing member as set forth in claim 4, wherein each tread member between said side tread members has a lower end connected to a pair of downwardly diverging cross bars the width of which is approximately one-half the width of the connected tread member.

6. A sealing member according to claim 4 comprising an integral, one-piece construction throughout.

7. A sealing member comprising: an elastic body member having a pair of side walls, a bottom wall, laterally spaced tread members constituting a top wall, and a plurality of interconnected cross bars forming an internal supporting truss structure; said tread members having wear surfaces and including a tread member along each side of said sealing member and at least one tread member therebetween; the spaces between adjacent tread members having a width approximating that of said tread members, wherein some of said cross bars of said internal truss structure connect said top wall with said side walls and others of said cross bars connect said bottom wall with said side walls, said internal truss structure including an intermediate wall generally parallel to said side walls and aligned with the space between a pair of said tread members, said intermediate wall connecting said bottom wall to certain of said cross bars adjacent said top wall.

References Cited

UNITED STATES PATENTS

2,156,681	5/1939	Dewhirst	94—18
3,055,279	9/1962	Rinker	94—18
3,166,816	1/1965	Berg	94—18X
3,245,328	4/1966	Fassbinder	94—18
3,276,336	10/1966	Crone	94—18
3,316,574	5/1967	Pare	94—18X
3,323,426	6/1967	Hann	94—18
3,358,568	12/1967	Brown	94—18
3,466,987	9/1969	Shimizu	94—18
3,482,492	12/1969	Bowman	94—18
3,485,149	12/1969	Boney	94—18

NILE C. BYERS, JR., Primary Examiner