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Bowman

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[54] **EXPANSION JOINT SEAL**

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[63] Continuation of Ser. No. 380,675, July 19, 1973, abandoned.

[52] **U.S. Cl.** **404/64**; 404/65

[51] **Int. Cl.**[2] **E01C 11/10**

[58] **Field of Search** 404/47, 64, 65, 69; 52/309, 396, 523

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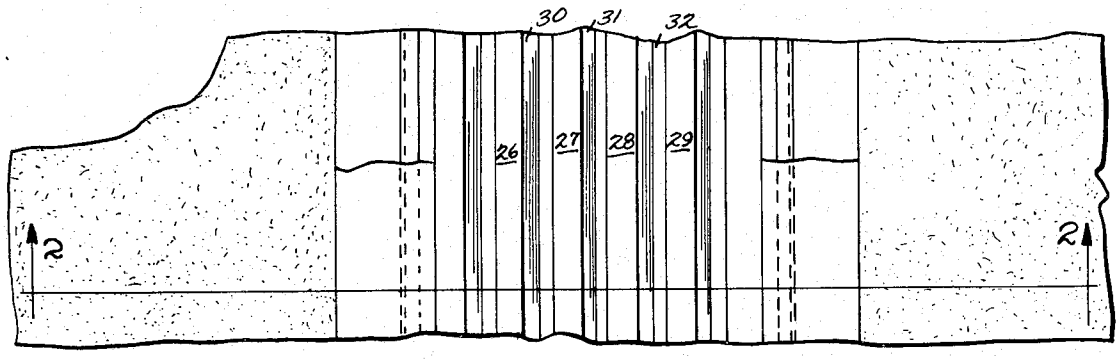
[57] **ABSTRACT**

A preformed elastomeric seal for highways and bridges having a pair of heart-shaped tubes side-by-side and a rib connecting the lower portions of the hearts. Metal extrusions fasten the seal to the road.

4 Claims, 4 Drawing Figures



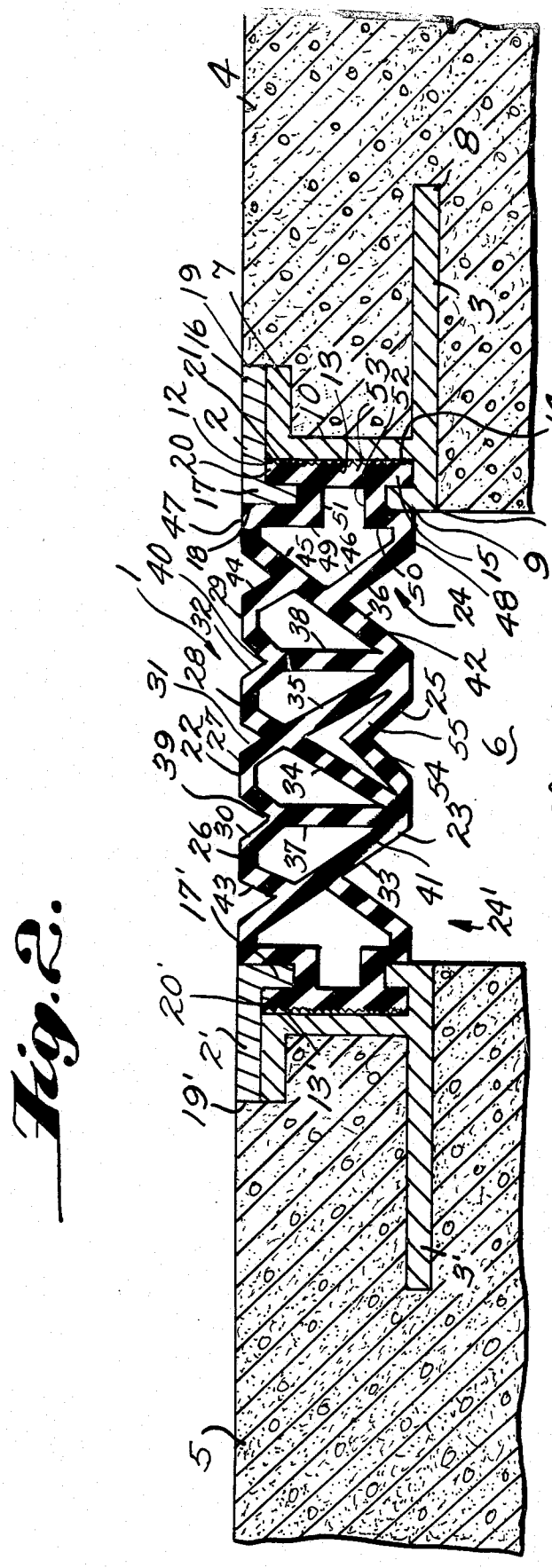


Fig. 2.

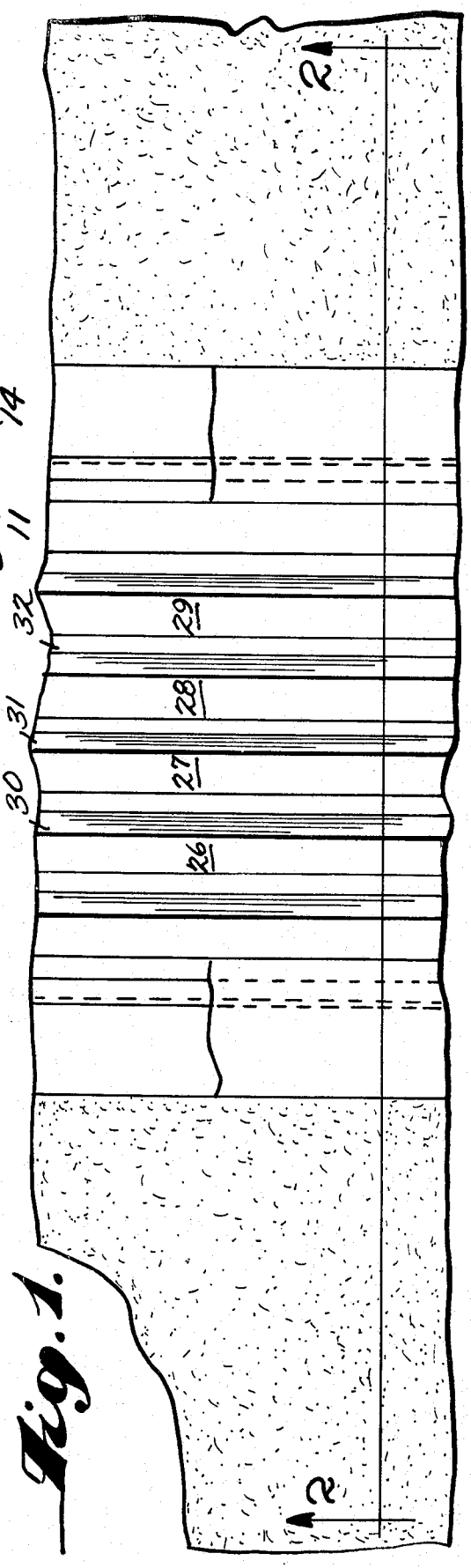


Fig. 1.

Fig. 3.

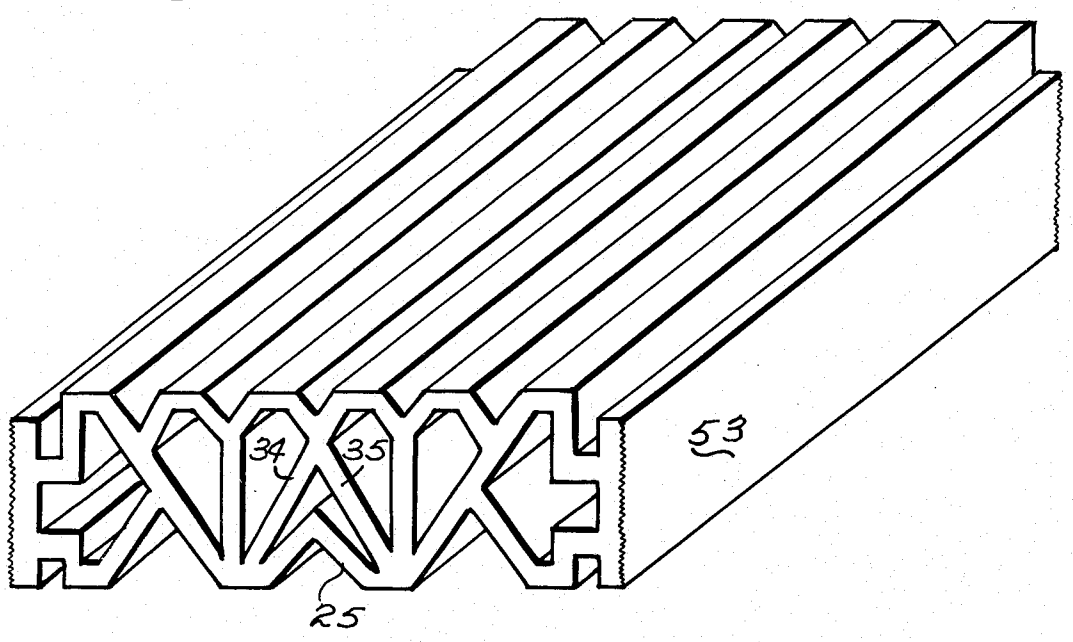
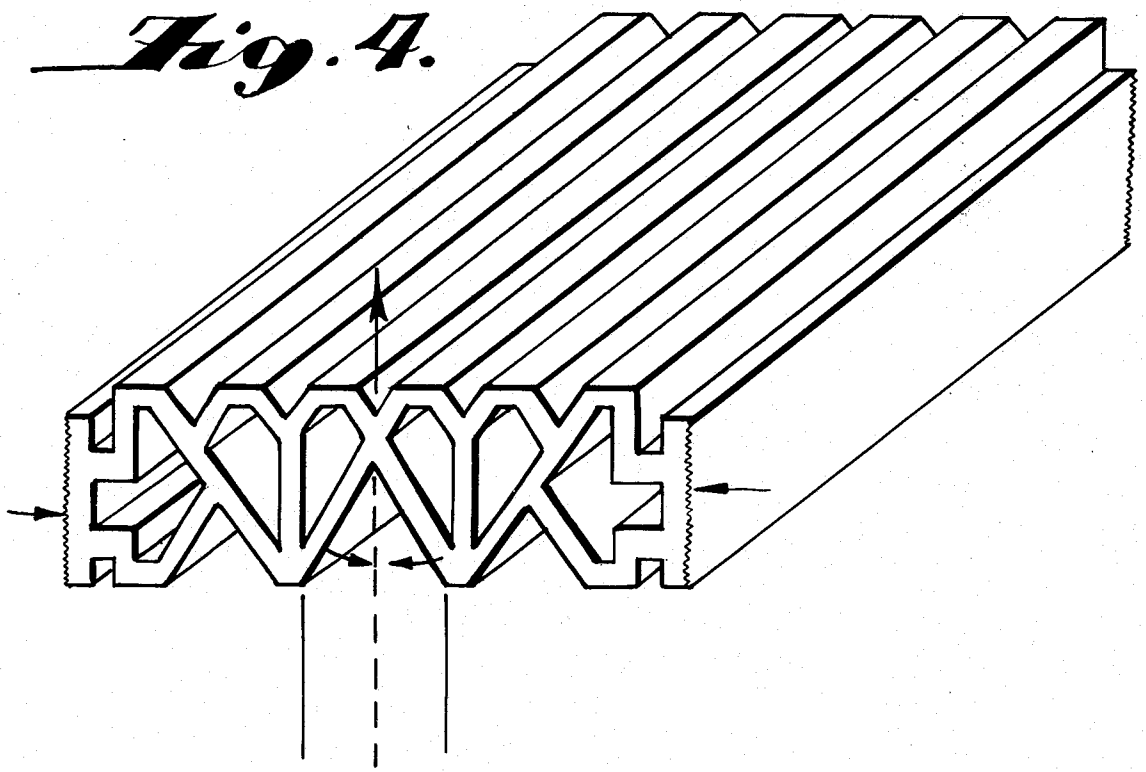


Fig. 4.



EXPANSION JOINT SEAL

This is a continuation of application Ser. No. 380,675 filed July 19, 1973, now abandoned.

The present invention relates to a relatively lightweight preformed sealing system for expanison joints in masonry structures such as sidewalks and interior flooring at the junction between adjoining buildings. The sealing system is characterized by relatively large movement ratings, shallow depth, easy replacement of its elastomeric sealing element, reduced tendency to elevate when compressed during expansion of the masonry structure and secure anchorage to the masonry.

A preferred embodiment of the invention will be described, reference being made to the drawing in which

FIG. 1 is a plan view of the sealing system and adjoining masonry structures;

FIG. 2 is a cross-section along line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the elastomeric sealing element of the system illustrated in FIGS. 1 and 2; and

FIG. 4 is a perspective view of another embodiment of elastomeric sealing element capable of use with the sealing system but susceptible to elevating when compressed.

The sealing system comprises an elongated prefabricated elastomeric sealing member 1 and rigid brackets comprising elongated metal extrusions 2, 2', 3 and 3' which secure it to the masonry structures 4 and 5.

The masonry structures 4 and 5 typically are concrete, and they are separated by an expansion joint 6 into which the concrete expands at high temperature. The extrusions 3 and 3' are embedded in the concrete along the edge of the joint when the concrete is poured. Each might be considered to consist in cross section of upper and lower horizontal segments 7 and 8, the latter being approximately three times as long as the former, and outer and inner vertical segments 9 and 10, extending upwardly from the lower segment 8 and the latter being approximately seven times as high as the former. The outer vertical segment 9 extends upwardly from the outer edge 11 of the lower horizontal segment 8 and the inner vertical segment 10 extends vertically from a point on the lower horizontal segment 8 inwardly from edge 11, the segment 10 extending upwardly to the outer edge 12 of upper horizontal segment 7. The outer face 13 of inner vertical segment 10 forms a facing for the masonry structure 4, and there is a groove 14 between it and the outer vertical segment 9 which receives a corner locking rib 15 of the sealing element 1.

The extrusions 2 and 2' each are angles having a relatively wide horizontal segment 16 and a short vertical segment 17 extending downwardly from the outer edge 18 of the horizontal segment 16. The extrusions 2 and 2' are screwed or otherwise fastened to the upper surfaces of the upper horizontal segments 7 and 7', and their inner edges 19 and 19' are aligned with the inner edges of said upper horizontal segments. When so mounted, they provide grooves 20 and 20' between the vertical segments 17 and 17' and the outer faces 13 and 13' of the vertical segments 10 and 10' which receive corner locking ribs 21 and 21' of the elastomeric sealing element 1. Thus the extrusions 2, 2', 3 and 3' provide armored edges for the masonry structures 4 and 5 and corner-locking anchorage for the elastomeric sealing element 1. They also provide convenient means for replacement of the elastomeric sealing element 1.

The extrusions are mounted so that the upper surfaces of extrusions 2 and 2' are level with the surfaces of the masonry structures 4 and 5. It will be seen that the upper surface of the elastomeric sealing element also is level with the masonry structures when expanded. An important advantage of that element is that it does not substantially rise above the masonry structures when it is compressed.

The elastomeric sealing element 1 is illustrated in the drawings in its relaxed state, i.e., neither stretched nor compressed. It consists of a plurality of integral webs in the form of integrally-connected elongated tubes, most easily made by extrusion. It is made of an elastomeric material, compounded for example, from natural or synthetic rubber. For exterior uses where the element will be exposed to sun and extreme temperatures, it preferably is based on neoprene, GRS or other durable rubber, but for interior uses, other types of elastomer may be satisfactory. Typical web thicknesses are of the order of one-eighth inch.

For convenience of description, the elastomeric sealing element 1 may be considered to consist of two heart-shaped tubes, side-by-side and anchorages to connect them to the extrusions 2, 2', 3 and 3'. Alternatively the sealing element may be regarded as consisting of interconnected upper and lower undulating members 22 and 23, having dart-shaped anchorages 24 and 24' at the ends of the element and a reinforcing web 25 at the bottom of the element for reasons explained below. The upper undulating member 22 has four short flat elongated horizontal webs 26, 27, 28 and 29, whose tops are in line with each other and the upper surfaces of the masonry structures 4 and 5, and laterally spaced from each other. Between them there are three congruous shallow V-shaped webs 30, 31 and 32, whose upper edges are integral with the edges of the webs 26, 27, 28 and 29. The angles at the bases of webs 30, 31 and 32 are approximately 60°. Thus, the webs 30 and 32 each include a pair of ribs extending upwardly and outwardly from the bottom of a shallow groove in the top of one of the respective heart-shaped tubes mentioned above.

The lower undulating member 23 is essentially W-shaped, consisting of inclined webs or legs 33, 34, 35 and 36. Webs 34 and 35 are straight-line extensions of the legs of V-shaped web 31, the webs crossing, so to speak, at the base of web 31 which is at a point approximately one-third of the distance from the top of the elastomeric sealing element 1 to its bottom. The webs 33 and 34 and the webs 35 and 36 meet respectively at the base of the elastomeric sealing element 1, joining at angles of approximately 60°and providing the bottom legs of the respective heart-shaped tubes mentioned above. The upper ends of webs 33 and 36 extend to a point approximately midway between the top and bottom of element 1.

The upper and lower undulating members 22 and 23 are interconnected by vertical webs 37 and 38, which connect respectively the valleys 39 and 40 of the upper web with the valleys 41 and 42 of the lower web. The valleys 39 and 40 of upper undulating member 22 are at the bases of the V-shaped webs 30 and 32 and the valleys 41 and 42 are at the junctions respectively of webs 33 and 34, and webs 35 and 36. Thus the upper and lower undulating webs are interconnected, valley to valley by webs 37 and 38 and valley to ridge at the base of web 31.

At the outer edges of webs **26** and **29** there are downwardly and outwardly inclined webs **43** and **44** which connect to the dart-shaped anchorages **24** and **24'**. These webs or ribs **43** and **44** and two ribs which comprise the V-shaped web **31** thus extend downwardly and outwardly from the upper ends of the ribs which comprise webs **30** and **32.** The ends of these downwardly and outwardly extending ribs connect to the distal ends of the legs **33, 34, 35** and **36** to enclose the respective heart-shaped tubes.

The dart-shaped anchorages **24** and **24'** are, in cross section, mirror images of each other. Therefore, only the anchorage **24** will be described. The anchorage **24** consists of webs **45** and **46** which incline outwardly and respectively upwardly and downwardly from the upper end of web **36.** About half-way up web **45,** it is integrally connected to the edge of web **44,** forming a valley which is lower than the valleys **39** and **40,** and the base of web **31.** This arrangement tends to confine the lifting tendency to the center of element **1** so that it can be corrected by web **25** as described below. The outer edges of webs **45** and **46** are connected respectively with short upper and lower horizontal webs **47** and **48,** the former having its top level with the tops of webs **26–29** and the latter being aligned with the bottom of lower undulating web **23.** Extending downwardly from the outer edge of web **47** is a vertical web **49,** and a corresponding vertical web **50** extends upwardly from the outer edge of web **48,** webs **49** and **50** being co-linear but not meeting. Parallel horizontal webs **51** and **52** extend outwardly from the lower and upper ends of webs **49** and **50** respectively, to vertical web **53,** the upper and lower portions of web **53** constituting corner locking ribs **21** and **15** respectively. The outer surface of vertical web **53** is serrated to reduce slippage and increase bonding to the segment **10.**

The elastomeric sealing element as described above constitutes the embodiment illustrated in FIG. **4.** It has been found that this element bows upwardly when it is compressed. This is in part the result of the asymmetric positioning of the dart-shaped anchorage in respect to the shallow valleys in the upper undulated member **22,** the latter configuration being selected to reduce the width of webs **30–32** to provide a satisfactory walk-on surface. In accordance with the preferred embodiment of the invention, however, this difficulty is avoided by means of reinforcing web **25.** This web is an inverted V whose outer edges are connected respectively to the junctions of webs **33, 34,** and **37** and webs **35, 36** and **38** thus connecting the bottoms of said heart-shaped tubes. Its upper edge is lower than the junction of inclined webs **34** and **35,** having therefore a larger angle between its straight legs **54** and **55** than there is between webs **34** and **35.** As a consequence, it reduces the tendency of webs **34** and **35** to be folded against each other, which would permit the center of elastomeric sealing element **1** to be lifted. On the other hand, web **25** can be folded, as the seal is compressed, so that it does not reduce the movement rating of the seal.

It will be seen, therefore, that the sealing system illustrated in the drawings provides a relatively flat, walk-on surface, which tends to remain at the same level as the

adjoining masonry structures when compressed, although it is sufficiently wide that it has a relatively large capacity to be compressed. Therefore, it is capable of being used in expansion joints having relatively large movements. On the other hand, it is of relatively shallow depth compared to typical large-movement seals. The sealing element is securely locked to the masonry structures and yet is relatively easily replaced.

It will be appreciated that the embodiments described above are those presently preferred. However, it is to be understood that changes may be made in details of construction and mode of operation without departing from the invention as hereinafter defined.

I claim:

1. A preformed elastomeric seal for an expansion joint comprising an elongated tube which, in cross section, comprises

a pair of heart-shaped members, connected to each other in side-by-side relationship, each of said heart-shaped members having

1. an undulating upper surface including a pair of ribs (**30, 32**) extending upwardly and outwardly from the bottom of a shallow grove (**39, 40**) extending downwardly from a middle position at the top of said seal, and ribs extending downwardly and outwardly from the upper ends of said upwardly and outwardly extending ribs (**43, 44, 31**) to the bottoms of shallow grooves extending downwardly from the top of said seal adjacent said heart-shaped members,

2. a pair of legs (**33, 34, 35, 36**) extending upwardly and outwardly from the bottom of said heart-shaped member and connected at their distal ends to the ends of said downwardly and outwardly extending ribs, whereby there is a deep groove between the lower portions of said heart-shaped members, and

3. vertical ribs (**37, 38**) connecting between the bottom of said first-mentioned shallow grooves and the junction of said legs at the bottom of said seal,

and a rib (**25**) connecting the bottoms of said heart-shaped members to reduce their tendency to be pressed together thereby reducing upward bulging of said seal, said bottom-connecting rib and portions of said legs forming the bottom of said tube.

2. A preformed elastomeric seal as set forth in claim **1** in which the rib connecting the bottoms of the heart-shaped members is an inverted V.

3. A preformed elastomeric seal as set forth in claim **1** including means for securing the outer sides of said heart-shaped members to masonry units which meet at said expansion joint.

4. A preformed elastomeric seal as set forth in claim **3** in which said securing means comprises a rib (**45**) extending upwardly and outwardly from said groove adjacent said heart-shaped member and a rib (**46**) extending downwardly and outwardly from said leg and means for securing the distal ends of the two last-mentioned ribs to a masonry structure adjacent said expansion joint.

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