July 9, 1968 A. J. HARBERT 3,391,510

CONTRACTION CONTROL JOINT

Filed May 26, 1966 2 Sheets-Sheet 1

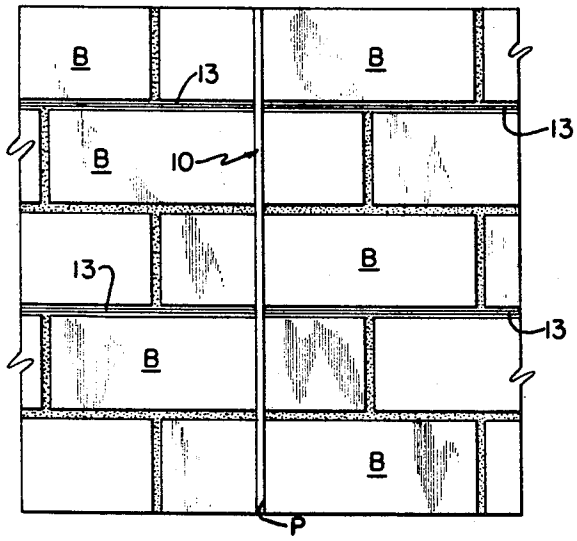


Fig. 1

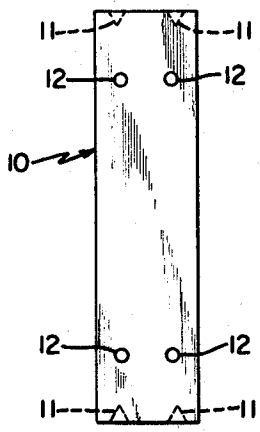


Fig. 2

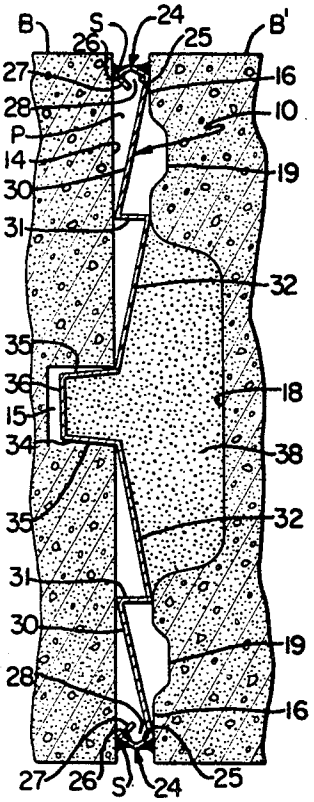


Fig. 3

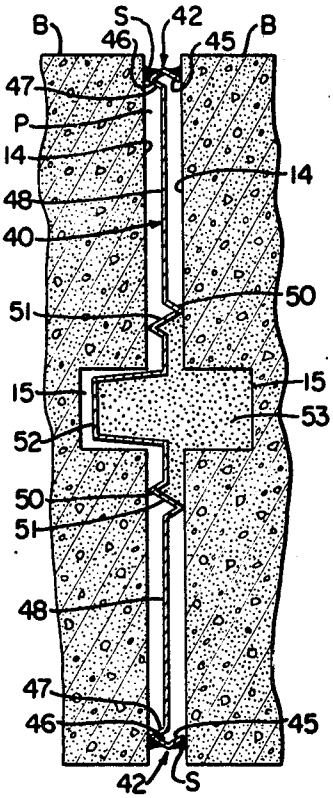


Fig. 4

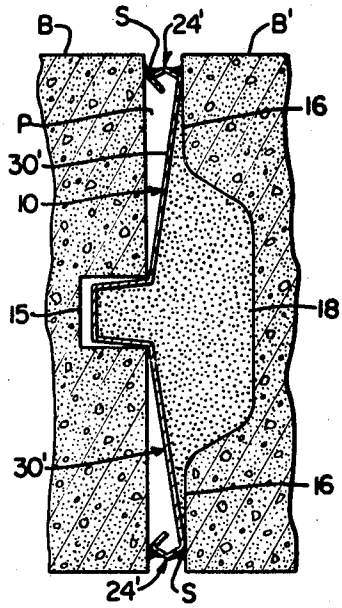


Fig. 5

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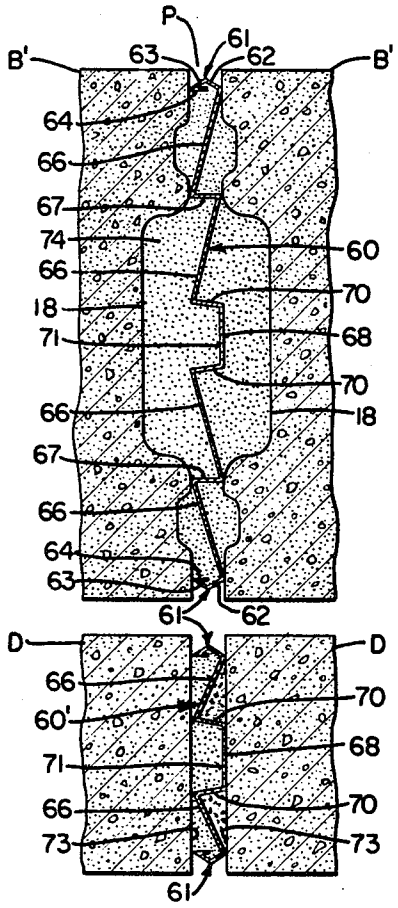


FIG. 6

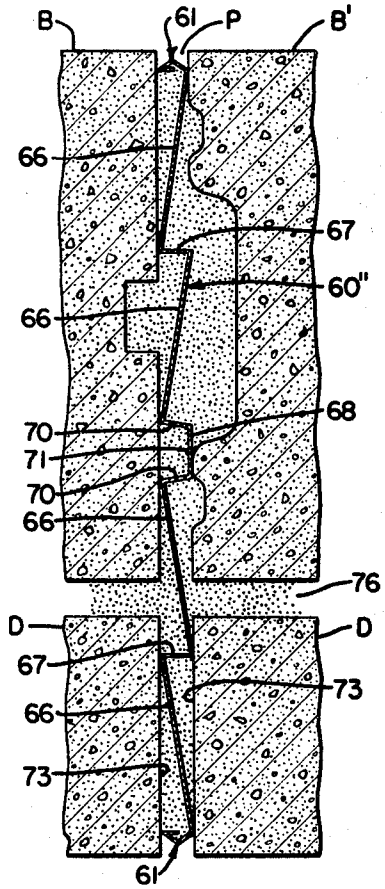


FIG. 7

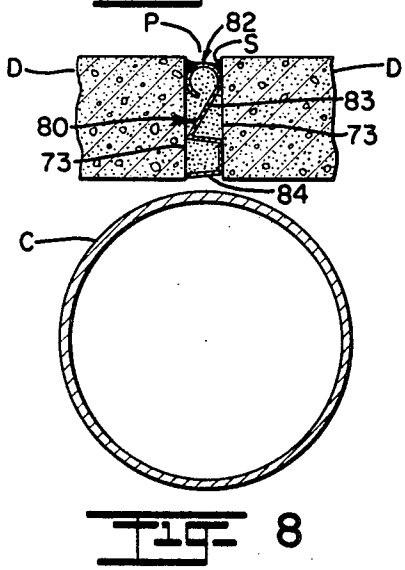


FIG. 8

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CONTRACTION CONTROL JOINT

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16 Claims. (Cl. 52—396)

ABSTRACT OF THE DISCLOSURE

Contraction control joint for masonry or concrete building wall structures is formed of a unitary sheet metal strip which is bent to provide convex sealing edges along opposite sides of the space between walls with a sealant applied along the edges, and the joint is further bent to define a series of angular sections between the outer convex edges together with an intermediate channel or key-shaped section, the latter being grouted in such a way that shear loads are transferred directly through the grout and channel section between the confronting wall surfaces.

This invention relates to novel and improved masonry control joints, and more particularly relates to a contraction control joint being adaptable for installation vertically between adjacent wall portions of a building in order to establish improved lateral stability and more effective load transfer between the wall portions.

A particular problem inherent in the construction of masonry or concrete building wall structures is that of cracking, largely due to the absence of an effective means of transferring loads laterally or in shear across the spaces or parting lines formed by contraction of the wall portions. Although various types of joints and reinforcing members have been devised in the past to overcome this problem, there is nevertheless a definite need for a control joint which will more effectively transfer loads between building wall portions and in such a way as to greatly minimize cracking while establishing a weatherproof, watertight seal between the wall portions. Moreover it is desirable that the joint be readily conformable for use either between flat, grooved or recessed confronting wall surfaces.

It is therefore an object of the present invention to provide for a novel and improved method and means for transferring loads between adjacent wall portions of a building wall structure, particularly those composed of masonry or concrete; and in accomplishing same to insure complete lateral stability of the wall by effectively transferring wind and other loads directly between the adjacent wall portions in an efficient and reliable manner.

Another object of the present invention is to make provision for the requisite lateral stability in a building wall structure composed of masonry or concrete whereby to minimize cracking in the walls and to establish complete weatherproof seal characteristics at the joint notwithstanding elongation of the joint or shifting of the walls.

A further object of the present invention is to provide for a contraction control joint adaptable for use in virtually any type of masonry or concrete building wall structure, such as, poured concrete, precast concrete, concrete block, brick, tile, stone and the like, and wherein the control joint may be furnished in any desired length or width, and further may be cut to size in the field according to the required length and wall thickness; and furthermore wherein the control joint in accordance with the present invention may be used singly or in combination and is further adaptable for use either between flat, grooved or recessed wall surfaces.

A still further object of the present invention is to minimize lateral slippage between adjacent wall portions of a building structure and to provide for increased lateral stability by transferring lateral loads through any of four

different possible combinations consisting of load transfer between opposing wall surfaces and between opposite sides of the joint.

An additional object of the present invention is to provide a contraction control joint which is economical in construction as well as being time and labor-saving in installation and use and further effects substantial savings in the cost of sealants required.

In accordance with the present invention, different forms of contraction control joints are hereinafter illustrated and described specifically for installation in the space formed as a result of contraction between adjacent wall portions of a concrete or masonry structure. In each form, the joint is capable of forming a weatherproof seal across the space while effectively transferring loads particularly in shear between the adjacent wall portions along opposite sides of the space and either from one side of the wall portion to the other or from one side of the joint to the other. In each form of invention, the control joint preferably is formed of a unitary sheet metal strip which is bent along longitudinal lines throughout its length to provide convex sealing edges along opposite sides of the space and which edges may either be flush with or recessed within the space. To form a seal along opposite margins of the joint, the sealant, such as, a caulking compound may be applied along the convex edges so that the edges will have the tendency of spreading the sealant outwardly into the pores of the masonry or concrete wall structure to form a waterproof seal. Intermediately between the convex edges, the joint is further bent to provide an intermediate channel or key-shaped portion extending in a perpendicular direction across the space between the wall portions, and the channel section is grouted in such a way that shear loads are carried directly through the grout and channel portion between the confronting surfaces. In addition, the joint is comprised of alternate angular and transverse bends on opposite sides of the intermediate channel-shaped portion which will further cooperate in transferring loads in shear between the end surfaces. The entire joint may be grouted with mortar to cooperate in transferring loads or the same may be accomplished in certain applications by grouting one side of the joint or simply by grouting through the channel section only. It is emphasized in this connection that the joint is capable of transferring shear loads in any given direction or angle between grooved or flat confronting end surfaces. By virtue of the symmetrical configuration of the control joints to be described, they may be fabricated in standard lengths and widths, but may be reduced in length or width according to special applications in the field without reducing their effectiveness in use. In this relation, the joints may be used between adjacent concrete or masonry wall surfaces as well as between steel or concrete columns and masonry or concrete wall surfaces and further may be used singly or in combination in relatively thick walls or in double walls all in a manner to be described.

The above and other objects, advantages and features of the present invention will become more readily appreciated and understood from the following description, the accompanying drawings and the appended claims.

In the drawing:

FIGURE 1 is a view in elevation of a control joint installed in the vertical space formed between rows of concrete blocks.

FIGURE 2 is a side view of the control joint installed in the vertical space of a wall structure as shown in FIGURE 1.

FIGURE 3 is an enlarged cross-sectional view of one form of control joint in accordance with the present invention.

FIGURE 4 is a cross-sectional view of another form of control joint.

FIGURE 5 is an enlarged cross-sectional view of still another form of control joint.

FIGURE 6 is a cross-sectional view showing the use of a pair of control joints in combination with a double wall structure.

FIGURE 7 is another cross-sectional view of a single control joint positioned in the space within a double wall structure; and

FIGURE 8 illustrates the application of still another form of control joint in a narrow wall structure alongside a column.

Referring in detail to the drawings, FIGURES 1 to 3 illustrate a control joint **10** embodied in a building wall structure made of staggered, horizontal rows of concrete blocks generally designated at B. At selected intervals along the wall structure vertical parting lines left between the walls will permit contraction of the wall portions so as to form vertical spaces P, as represented in FIGURE 1, which extend the entire height of the building wall structure between confronting wall surfaces of the blocks B. The blocks B along opposite sides of the space may have facing end surfaces of different specific configurations well known in the art; for example, the blocks may be hollow or solid-core blocks having flat, unbroken end surfaces or may be suitably notched or recessed in various ways to be illustrated for use along window sash sections and which blocks are commonly referred to as sash blocks.

Generally, in accordance with the present invention, the joint **10** is formed of an elongated sheet metal strip which is dimensioned to extend the entire length and to traverse the substantial width of the space P. In each form to be described, the strip is preformed or prefabricated to be of uniform cross-section throughout its length and specifically in such a way as to establish complete lateral stability between the wall portions by transferring shear loads across the space. Moreover, a sealant may be applied along opposite lateral margins of the strip, and the remaining space may be grouted by filling with a mortar or suitable concrete mix along one or both sides of the strip. As illustrated in FIGURES 1 and 2, notches **11** may be formed in opposite ends of the strip, or apertures **12** may be formed at intervals along the length of the strip to permit insertion of reinforcing bars **13** which are embedded within the mortar joints between the concrete block rows B.

Now considering in more detail the form of control joint shown in FIGURE 3, a contraction control joint **10** is positioned within the space P between rows of blocks B and B'. The blocks B are arranged in superimposed relation with their facing end surfaces **14** being recessed to provide aligned vertical notches **15**. In turn the blocks B' have spaced end surfaces **16** separated by an intermediate, relatively broad recessed area **18** opposite the notch **15** together with relatively shallow recessed areas **19**. The joint **10** is formed of an elongated sheet metal strip member which is bent along longitudinal lines to define return flanges **24** along opposite lateral margins of the strip, each flange being correspondingly formed of a succession of three angular portions **25**, **26**, and **27** with each portion being bent at an acute angle to the next preceding portion. Here it will be seen that sections **25** and **26** extend across the end of the space with opposite corners contacting the confronting end surfaces of the blocks B and B' and specifically to present an outwardly projecting convex surface between the end surfaces to facilitate application and spreading of a sealant S therealong. The inwardly directed, terminal portion **27** merely establishes a restricted space or cavity **28** within the flange.

Relatively broad angular portions **30** extend inwardly from each of the return flanges **24**, and each angular portion **30** is directed at an angle from a point contacting the side of the angular portion **25** against the end surface of the block B' across the space to the opposite end surface of the block B where it is interrupted by a relatively narrow transverse portion **31**. The portion **31** extends perpendicularly across the space with its opposite side in turn being joined to one side of a second angular portion **32** which is directed inwardly therefrom and at an angle substantially parallel to that of the first angular portion **30**. Together, the innermost angular portions **32** extend inwardly and terminate in a common, intermediate, U-shaped channel section or key **34** which has transverse portions **35** interconnected in spaced relation by a common, central connecting portion **36** extending between sides of the transverse portion **35** opposite that of the innermost angular portions **32**. It will be seen that the channel-shaped section **34** defines a transverse convergent projection away from the normal plane of the strip and is dimensioned to fit within the aligned notches **15** formed along the end surface of the blocks B.

Preferably, the joint **10** is completed by filling the inner recessed area **18** and the channel-shaped section **34** with mortar **38** which is confined within the recessed area by the innermost angular portions **32** bridging the gap across opposing end surfaces. Customarily, the mortar will exhibit some shrinkage in setting and be bonded to the surface of the block B' along the recessed area **18**; however it is not essential that the mortar adhere to the metal strip for effective load transfer, and in fact the strip may be treated with an agent specifically to prevent bonding of the mortar to the sheet metal. In this relation, the somewhat divergent sides **35** of the section **34** will permit the mortar to shrink or contract away from the sheet metal strip. Nevertheless, loads applied either normally across the joint or in shear at some angle to normal are transmitted through the grout and channel section which is reinforced by the angular and transverse bend portions **30–32**.

The sheet metal strip is installed by inserting same vertically through the space with the intermediate channel **34** aligned with the notches **15**. Once installed, a sealant S is applied under pressure along opposite lateral margins of the strip so that, when forced against the outer surfaces of the angular portions **25** and **26**, the sealant will spread outwardly against the block end surfaces and into the pores of the masonry along the corners of the flange thereby effecting a complete weatherproof and watertight seal. In turn, mortar **38** is used to fill the space on one side of the joint between the channel portion and recessed area **18** or may be used on both sides of the joint to completely fill the remaining space after insertion of the strip. In filling the space, it will be noted that the flanges **24** on opposite lateral margins will prevent outward flow of the mortar **38** or other grouting composition from the space. In this relation, the flanges **24** may be flush with the sides of the blocks or may be recessed inwardly as shown in FIGURE 3.

In FIGURE 4, the vertical parting line or space P is illustrated between rows of concrete blocks B, the blocks having confronting end surfaces **14** with aligned, vertically extending center notches **15**. A modified form of elongated sheet metal strip **40** is inserted within the space and is bent to comprise return flanges **42** along opposite lateral margins of the strip, each flange being defined by a generally V-shaped angular section made up of angular bends **45** and **46** which together present a generally convex end surface across the end of the space to facilitate application of the sealant. In addition, the third angular portion **47** is directed inwardly at an acute angle from one side of the angular portion **46** to merge with a relatively broad section **48** extending parallel to and in spaced relation between the end surfaces **14** and being interrupted by V-shaped bends **50**, the latter including a transverse portion **51** traversing the space between the end surfaces. The sec-

tions 48 continue inwardly to terminate in a generally U-shaped channel section 52 which is dimensioned to fit within one of the notched areas 15. Again the channel and opposite notch are grouted full, as represented at 53, and the transverse portions 51 serve to retain the mortar within the designated area 53. As described with reference to FIGURE 3, a sealant S may be applied along the flanged sections 42 to establish a seal with the end surfaces.

In FIGURE 5, a modified form of joint 10 is vertically installed in the space formed between rows of superimposed blocks B and B' of reduced width, and wherein the blocks B have aligned notches 15 and blocks B' each have a recessed area 18 between end surfaces 16. The joint 10 is formed in much the same manner as the joint 10 shown in FIGURE 3, and is correspondingly made up of outer return flanges 24' and angular portions 30' terminating in a common U-shaped channel section section 34' which is directed outwardly for insertion within the notched area 15. As shown, the space is grouted between the recess 18 and the channel section 34', and the angular portions 30' serve to retain the grout within the space while lending additional reinforcement to the channel section for load transfer across the space.

In FIGURES 6 and 7, elongated sheet metal strips 60 are formed in a similar manner but are dimensioned to be of different widths according to wall thickness. Essentially, each strip 60 is bent to provide return flanges 61 along opposite lateral margins and which flanges are again formed with generally V-shaped angular portions 62 and 63 with a transverse return portion 64 of limited width. One or more angular portions 66 extend inwardly from each return flange and are interrupted by transverse return portions 67 extending in a perpendicular direction between the end surfaces of the wall portions. The innermost angular portions 66 terminate in a channel section 68 made up of transverse return portions 70 and a common connecting portion 71. As in the other forms, it will be seen that the transverse portions 70 diverge outwardly somewhat from the connecting portion 71 so that when the space is grouted within the channel section the grouting composition in setting up will be free to shrink or withdraw away from the channel section. Referring specifically to FIGURE 6, it will be seen that a pair of joints 60 and 60' are used in combination in a double wall structure having an inner wall comprised of concrete blocks B' and an outer wall comprised of relatively narrow bricks D, the latter having flat end surfaces 73. The joint 60 is arranged within the space P between the concrete blocks B' and has a pair of angular portions 66 interrupted by a transverse portion 67 flanking opposite sides of the channel section 68; whereas the joint 60' between the bricks D is formed with one angular portion 66 extending inwardly from each flange 61 for connection to opposite sides of a common channel section 68. It will be noted that this form of joint is similar to that shown in FIGURE 5 with the exception that the channel section 68 shown extends in the opposite direction to that of the channel section 58. Moreover, the concrete blocks B' generally correspond to the blocks B' as shown in FIGURE 3 to provide a central relatively deep recessed area 18 in each end surface. Even though the channel section 68 does not project into a recessed area in either of the end surfaces, effective keying and load transfer is accomplished by grouting the space on both sides of the strip 60 with a mortar or concrete mix composition 74 which will adhere to the end surfaces and cooperate with the strip 60 to transfer loads between the wall portions. In this form the grout is retained within the space by the return flanges 61 which traverse the ends of the space, and in this way loads are carried by the grout through the channel section as well as through the combination angular and transverse bends across the width of the joint.

The same result is achieved between flat end wall surfaces of the brick members D, since again the grout will act to transfer shear loads in virtually any direction or angle across the joint between the confronting wall surfaces 73. It will be noted in FIGURE 6 that the wall thickness of the brick members D is approximately one-half that of the blocks B', and if desired, an effective joint may be formed by breaking a strip 60 in half along its length and inserting it into the space formed between the brick members. This may be faciilitated by selectively weakening the joint along the center line or longitudinal axis of the joint 60 so that for such applications the strip may be readily divided.

In FIGURE 7, a double wall thickness is again illustrated as being comprised of an inner wall formed of blocks B and B' and an outer wall made up of bricks D having a common vertical space or parting line P. Here the joint is defined by a single, relatively wide strip 60'' which traverses the common space formed between the double wall including the intervening space 76 between the inner and outer wall sections. Again, the strip 60'' is comprised of return flanges 61 along opposite margins together with a succession of angular and transverse bands 66 and 67 flanking opposite sides of an intermediate channel section 68. The entire joint is grouted full with mortar and in this instance it will be seen that the channel section 68 is disposed between flat end surfaces, as opposed to the notched or recessed areas. Nevertheless, effective keying is provided by the strip in cooperation with the mortar to transfer loads in shear both through the channel section 68 and the angular transverse bends 66 and 67.

In FIGURE 8, a modified form of joint 80 is shown for use in a space P formed in a narrow wall section on one side of a column or pipe member C. The wall section may be suitably comprised of bricks D having flat end surfaces 73 and in turn the joint is defined by an elongated sheet metal strip having an outer convex rounded return flange 82, an inwardly directed angular portion 83 and a channel section 84 at the inner terminal end of the strip. The remaining space is grouted as illustrated and a sealant S is applied along the outer convex surface of the flange portion 82 so as to spread outwardly into sealed relation between the sides of the flange and the confronting end surfaces of the bricks D, as illustrated. Here it is not at all necessary that the joint be provided with return sealing flanges along both margins since only one margin across the external face of the blocks will be exposed. As in the other forms, the channel section or key, as well as the angular portions will serve to transfer loads in shear across the space.

In the different forms of joints herein illustrated and described it will be evident that each is capable of controlling load transfer under lateral shifting or movement between closely spaced confronting wall portions of a building wall structure. In this relation, effective keying to transfer loads across the space between the wall surfaces is achieved whether or not the channel section is aligned within a notch in one of the end wall surfaces. Moreover, the combination of transverse and angular portions between the channel sections and the end flanges will cooperate in transferring such loads as well as to retain the grout within selected areas of the joint. In order to effect the desired sealing along opposite margins of the joint, the return flanges may have outer rounded convex edges as shown in FIGURE 8, although it will be evident that the use of angular or V-shaped return flanges as illustrated in FIGURES 3 to 7 will serve to more effectively spread the sealant outwardly into contact with the confronting end surfaces and result in improved sealing characteristics. In general, the use of a sheet metal section provides the necessary characteristics of flexibility and strength and ready conformability for use in various installations where lateral load stability is a prime requisite. In this relation, the joint may be employed in various concrete and masonry structures, and in wall structures can be used in locations where the wall abuts a column, cross wall, pilaster or

wall recess. Moreover, where a space occurs between a masonry wall and steel column the joint may be inserted within the space and spot-welded or otherwise permanently affixed to the steel column to effectively transfer loads between the column and wall structure. The strip can be of any length or width, can be employed singly or in combination, and can be used with or without other reinforcing means.

It will be appreciated from the foregoing that various modifications and changes may be made in the construction, combination and arrangement of parts comprising alternate forms of the present invention. For example, the outer return flanges along opposite margins of the strip will serve as effective closures between the wall surfaces, in the absence of a sealant. In this relation, the sealant applied to the return flange externally of the building, but in most cases would not be required for the return flange internally of the building. In addition the reinforcing bars **13** shown in FIGURE 1 would have most useful application to concrete wall structures, but generally are not used or required in masonry walls. It is therefore to be understood that other modifications and changes may be made without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A control joint adapted for installation in a space between adjacent wall surfaces of a building structure, said joint comprising an elongated metallic strip traversing the substantial length and width of the space, said strip having outer flanged portions traversing the sides of the space between wall surfaces and a longitudinally extending, generally U-shaped, intermediate channel section between said flanged portions, and a grouting material filling at least the space within said channel section and adjacent space communicating with the space within said channel section, said grouting material being bonded to the wall surface bounding the adjacent space whereby to cooperate with said channel section for transferring loads in shear between the adjacent wall surfaces.

2. A control joint according to claim **1**, said strip having its channel section dimensioned to fit within a notched portion along one of the wall surfaces, and said grouting material being bonded to the other wall surface opposite to the notched wall surface.

3. A control joint according to claim **1**, said strip being disposed between a pair of relatively flat, spaced parallel wall surfaces, said grouting material filling the remaining space between the wall surfaces on opposite sides of said channel section, said flanged portions retaining said grouting material within the space to harden into bonded relation with the wall surfaces.

4. A control joint according to claim **1**, said elongated metallic strip being further characterized by including angular portions traversing the space between the wall surfaces on opposite sides of said channel section.

5. A control joint according to claim **1**, said channel section having a common, flat connecting portion and transverse portions diverging outwardly from said connecting portion, said channel section being dimensioned to fit within a recessed area within one of the wall surfaces.

6. A control joint according to claim **1**, said outer flanged portions each being in the form of a return flange presenting a convex surface of V-shaped cross-sectional configuration traversing the sides of the space between the wall surfaces, and a sealant being applied under pressure along the convex surfaces of said return flanges into sealed relation with the wall surfaces.

7. In a control joint for disposition in the space formed between adjacent wall surfaces of a building structure, a unitary metal strip being dimensioned to traverse the substantial width and length of the space, and said strip comprising outer return flanges each presenting a convex edge portion along opposite lateral margins traversing the space between adjacent wall surfaces, a sealant applied externally along each of said convex edge portions, a longitudinally extending, generally U-shaped channel section disposed intermediately of said flanged portions, and generally planar portions extending between opposite sides of said channel section and said outer flanged portions.

8. In a control joint according to claim **7**, said planar portions including a series of relatively wide angular sections interconnected by transverse sections extending inwardly between each of said flanged portions and opposite sides of said channel section.

9. In a control joint according to claim **7**, said metal strip having generally planar portions defined by relatively wide sheet metal sections extending in spaced parallel relation to said wall surfaces between each of said flanged portions and opposite sides of said channel section, each of said relatively wide sections being interrupted by a transversely extending portion traversing the space between the wall surfaces.

10. In a contraction control joint for disposition in a space between adjacent wall surfaces in a building structure, an elongated sheet metal strip being dimensioned to traverse the substantial length and width of the space, said strip being bent along longitudinal lines traversing the length of said strip to define an alternating series of angular portions and transverse return portions arranged at intervals across the width of said strip and an intermediate, longitudinally extending channel section including spaced-apart transverse portions and a common, relatively flat connecting portion therebetween, and a grouting material being inserted at least within said channel section to cooperate with said sheet metal strip in transferring shear loads between the adjacent building wall surfaces.

11. In a contraction control joint according to claim **10**, said angular portions being relatively wide and each extending at an angle across the space between adjacent wall surfaces, and said transverse portions being relatively narrow and each extending in a perpendicular direction across the space between the adjacent wall surfaces, each of said transverse return portions being joined along opposite sides to successive angular portions.

12. In a contraction control joint according to claim **10**, said channel section having said spaced-apart transverse portions extending in a direction opposite to that of said series of transverse return portions.

13. In a contraction control joint according to claim **10**, said channel section having its spaced-apart transverse portions extending transversely in the same direction as said series of transverse return portions.

14. A contraction control joint being adapted for use in a building wall structure having rows of masonry blocks arranged in superimposed relation with a vertical parting line forming a vertical space the height of the wall structure between spaced adjacent wall surfaces, at least one of each of the adjacent wall surfaces including a vertically extending groove extending for the entire height of the wall structure, said joint comprising an elongated sheet metal strip disposed in the space to extend for the substantial height of the wall structure and being further dimensioned to traverse the substantial width of the space, said strip being of uniform cross-section throughout its length and being bent along longitudinal lines to define angular flanges along opposite margins, each presenting a convex surface traversing opposite sides of the space between adjacent wall surfaces, a succession of relatively wide angular portions extending inwardly from opposite margins and an alternating succession of relatively narrow transverse return portions extending perpendicularly across the space between each pair of angular sections in succession across the width of the strip, and an intermediate, generally U-shaped channel section between a pair of said angular portions and being defined by spaced,

transverse portions interconnected by a straight portion extending parallel to the adjacent wall surfaces, said channel section being dimensioned for insertion within the groove formed in one of the adjacent wall surfaces.

15. A contraction control joint according to claim **14**, further including a sealant applied under pressure along the convex surfaces of said angular flanges for movement into sealed relation between said flanges and adjacent wall surfaces, and a grouting material inserted at least within said channel section to cooperate in transferring shear loads between the adjacent wall surfaces.

16. A contraction control joint according to claim **14**, said angular flanges including a pair of angular portions bent to define a generally V-shaped convex surface portion across each side of the space.

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