Dec. 4, 1956 J. N. HELTZEL 2,772,468

DOWEL BAR OR TIE BAR SUPPORTING SIDE FORMS

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FIG. 1

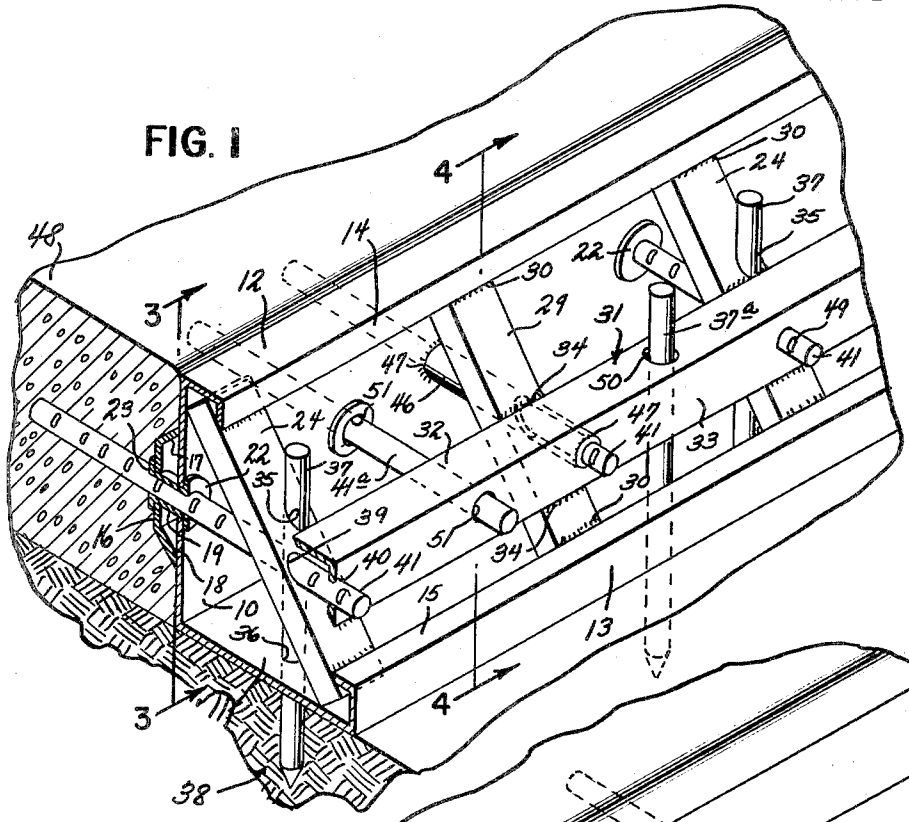


FIG. 7.

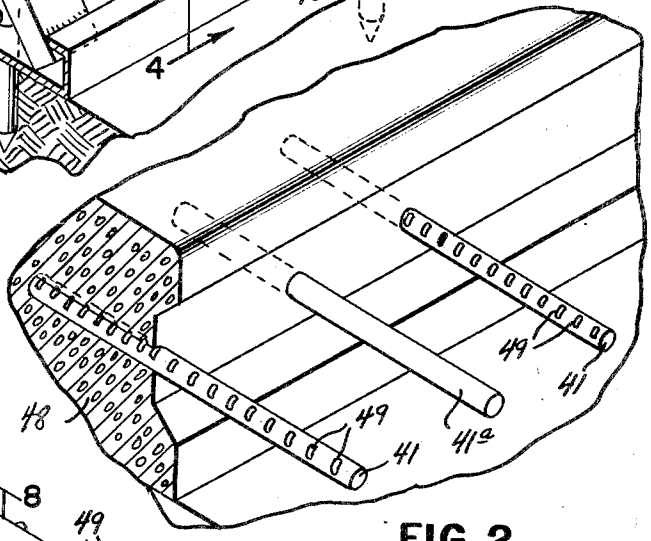


FIG. 2.

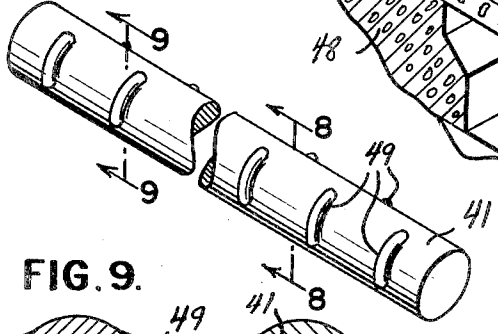


FIG. 9.

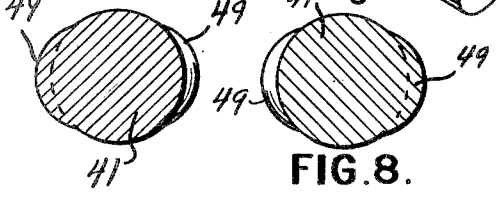


FIG. 8.

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DOWEL BAR OR TIE BAR SUPPORTING SIDE FORMS

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FIG. 3.

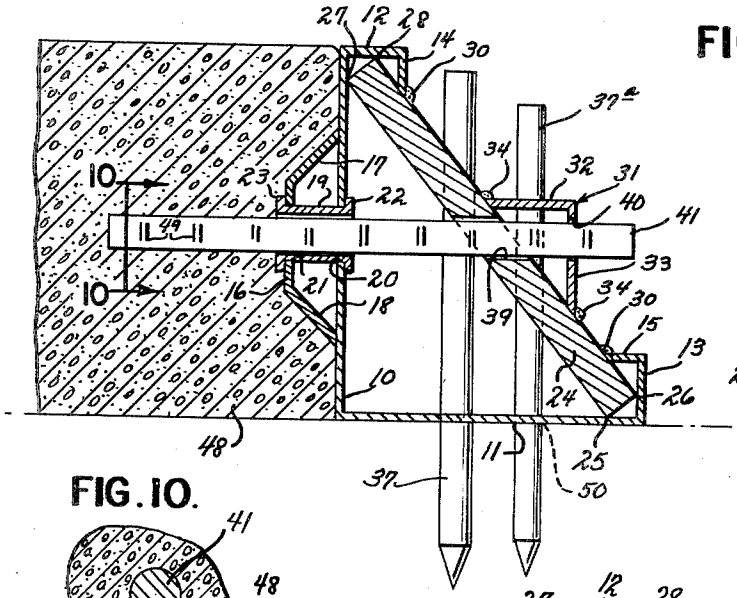



FIG. 6.

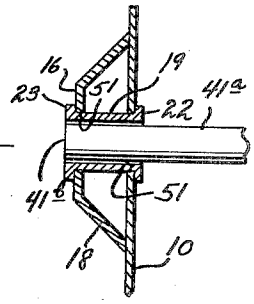



FIG. 10.



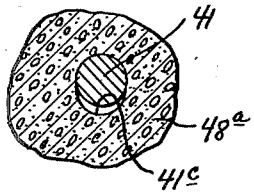




FIG. 11.

FIG. 4.

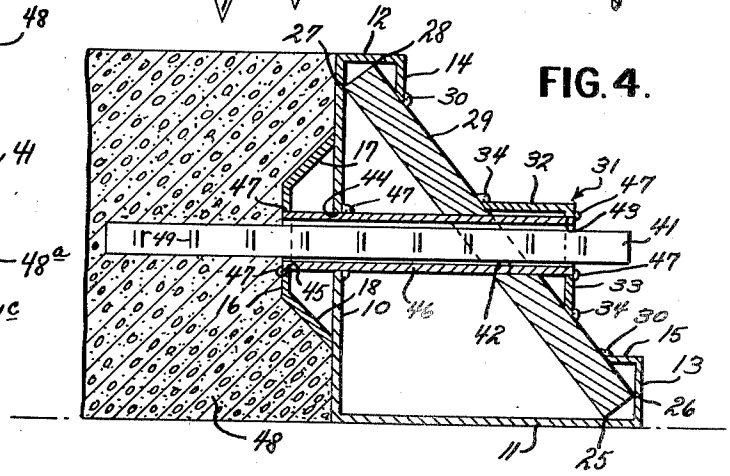
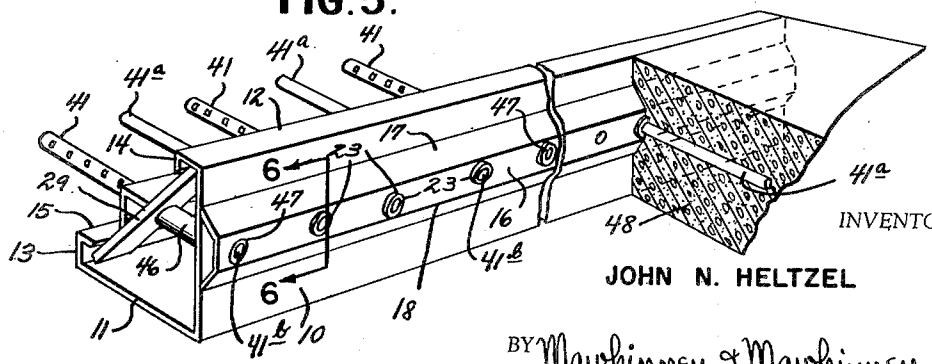



FIG. 5.

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2,772,468

# DOWEL BAR OR TIE BAR SUPPORTING SIDE FORMS

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Application June 16, 1951, Serial No. 231,981

10 Claims. (Cl. 25—118)

The present invention relates to improvements in dowel bar or tie bar supporting side forms and is a continuation-in-part of my co-pending application, Serial No. 697,699, filed September 18, 1946, now Patent No. 2,636,426, and entitled Dowel Bar Adjusting and Aligning Devices.

An object of the present invention is to provide an improved device of this chaarcter for use in connection with dowel or tie bars for load transfer devices currently employed in connection with concrete constructions, such as airport runways, concrete roads and the like, in which individual slabs of concrete are individually poured and laid with deformed tie bars tying adjacent slabs together in a unitary construction which nevertheless admits of local expansion and contraction of the individual slabs when plain bars are installed.

In one aspect the invention is concerned with the supporting of dowel bars in a bulkhead or side form which carries a grooving strip for forming a groove in the edge of the concrete slab. A critical phase of this development is the passing of the tie bars through the form and the grooving strip. In view of the fact that the tie bars are provided with lugs or protuberances (these tie bars or reinforcing bars are termed deformed bars because of the protuberances or roughness on the outside surface), such outside rough surface interfers with the stripping of the forms from the dowel bars. Moreover such protuberances or roughness of the tie bars as a practical matter preclude the possibility of readily removing or stripping the side forms over the bars without injury to the concrete slab; and it is another object of the invention to overcome this difficulty.

Another object of the present invention is to provide an improved device of this kind in which lighter gauge material for the forms may be utilized at the same time increasing the strength of the form over that of the conventional type so that the form will be able to withstand heavier machinery rolling on the top tread thereof, such as is used particularly in the construction of airports where extremely thick slabs, that is, of two or three feet or greater thickness, are constructed.

A further object of the present invention is to provide an improved side form into which means are incorporated for supporting the dowel bars at the proper elevation and for serving as guides between the form and the dowel bars during the stripping operation, whereby disturbance of the bars and the slab is prevented.

A still further object of the present invention is to provide an improved structure in which the guides will secure the grooving strip to the side form and also prevent the soft concrete from passing through the dowel bar openings and filling up the inside of the grooving strip.

With the foregoing and other objects in view, the invention will be hereinafter more fully described and more particularly pointed out in the appended claims.

In the drawings, in which the same parts are denoted by the same reference numerals throughout the several views,



Figure 1 is a fragmentary isometric projection of an improved dowel bar supporting side form constructed in accordance with the present invention and shown as applied to an airport runway or the like.

Figure 2 is a fragmentary isometric projection of the airport runway after the side form has been stripped from the dowel bars,

Figure 3 is a sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a sectional view taken on the line 4—4 of Figure 1,

Figure 5 is a perspective view of the improved side form taken looking at the inner side thereof.

Figure 6 is a sectional view taken on the line 6—6 of Figure 5,

Figure 7 is an isometric projection of one of the deformed dowel bars,

Figure 8 is a sectional view taken on the line 8—8 of Figure 7,

Figure 9 is a sectional view taken on the line 9—9 of Figure 7,

Figure 10 is a sectional view taken on the line 10—10 of Figure 3, and

Figure 11 is a fragmentary sectional view illustrating the honey-combing or voiding of the bar when the bar is placed in position first and the concrete then poured.

Referring more particularly to the drawings, **10** indicates the vertical web of the improved side form, **11** the base, **12** the top rail and **13** the upstanding base flange. A substantially vertical flange **14** extends downwardly a short distance from the free edge of the top rail **12** in spaced apart substantially parallel relation to the upper portion of the vertical web **10**. A substantially horizontal flange **15** extends inwardly from the upper free edge of the base flange **13** for a short distanee towards the vertical web **10**.

An edge grooving strip comprises a vertical wall **16**, a flange **17** extending upwardly and inwardly from the upper edge of the wall **16** toward the vertical web **10** of the side form and a flange **18** extending downwardly and inwardly from the lower edge of the flange **17** toward the vertical web **10** of the side form. The grooving strip may be secured by tubular members **19** to the vertical web **10** of the side form with the free edges of the flanges **17** and **18** engaging the outer face of the web **10**.

Each tubular member **19** extends through horizontally aligned openings **20** and **21** formed in the vertical web **10** and the vertical wall **16** and the opposite end portions of the members **19** extend beyond the outer face of the wall **16** and the inner face of the web **10**. The opposite extended end portions of each member **19** are rolled over to provide flaring lips **22** and **23** which tightly engage the inner face of the web **10** and the outer face of the wall **16** around the openings **20** and **21**.

Diagonal supports or stake pockets **24** which may be in the form of bars are secured to the side form at horizontally spaced apart locations. Each support **24** extends at an angle of the order of forty-five degrees to the web **10** and the base **11** and the lower front and rear edges of each support may engage the upper face of the base **11** and the inner face of the base flange **13** as indicated at **25** and **26** in Figures 3 and 4, although the front edge in Figure 1 is shown spaced from the flange **13**. The upper front and rear edges of each support **24** engage the inner face of the web **10** and the under face of the top rail **12** as indicated at **27** and **28**.

Diagonal supports **29** which may be similar in shape and size to the supports **24** are disposed in the spaces between the supports **24** in the same angular relation to the web **10** and the base **11** and engage the web, the base, the base flange and the top rail in the same manner as the supports **24**. The supports **24** and **29** may be se-

cured to the vertical flange 14 and the horizontal flange 15 of the side form by welding 30 or the like.

A longitudinally extending brace 31 which may be of angle iron formation in cross section has the free edges of its horizontal flange 32 and vertical flange 33 secured to the outer faces of the supports 24 and 29 as by welding 34 or the like. Each of the supports 24 has an aperture 35 therethrough which is in alignment with an aperture 36 in the base 11. A stake 37 extends through each pair of aligned apertures 35 and 36 and may be driven into the subgrade 38 for anchoring the side form in position. Each of the supports 24 also has a substantially horizontally extending through passageway 39 which is in alignment with the bore of the tubular member 19 and the vertical flange 33 of the brace 31 has through openings 40 one of which is in registry with each of the passageways 39 of the supports 24.

The passageways 39 are downwardly and laterally offset with respect to the apertures 35 of the supports 24 so that the stakes 37 will not interfere with the passage of dowel bars 41 through the openings 40, the passageways 39 and the tubular members 19.

Each support 29 has a substantially horizontally extending through-passageway 42 and the vertical flange 33 of the brace 31 has openings 43 one of which is in alignment with each of the passageways 42. The vertical web 10 of the side form and the vertical wall 16 of the grooving strip have openings 44 and 45 which are in registry with the passageways 42. A sleeve 46 extends through each passageway 42 and is received by the aligned openings 43, 44 and 45. The opposite outer ends of the sleeves 46 are substantially flush with the outer faces of the wall 16 and the flange 33 so as to cover the sharp edges of the openings 43 and 45. Each sleeve 46 may be restricted against longitudinal movement by being secured to the vertical web 10, the wall 16 and the flange 33 by welding 47 or the like.

Additional stakes, one of which is shown at 37*a* in Figures 1 and 3 of the drawings, may be positioned in the spaces between certain of adjacent diagonal braces 24 and 29 and extend through suitable vertically aligned openings 50 formed in the base 11 and the horizontal flange 32 of the brace 31. Smooth or plain bars 41*a* may be positioned in other spaces between adjacent diagonal braces 24 and 29 and are received by horizontally aligned openings 51 in the vertical flange 33 of the brace 31, the vertical web 10 and the vertical wall 16 of the grooving strip.

As illustrated in Figure 6 of the drawings, a tubular member 19 is received by the openings 51 of the wall 10 and the wall 16 to assist in securing the grooving strip to the vertical web 10 of the form. The bars 41*a* will be freely received by these members 19.

It will be noted that these bars 41*a* do not pass through the diagonal braces 24 and 29. This is important because these bars are some times spaced very close so this would preclude the possibility of having so many diagonal braces. The longitudinal brace 31 is utilized as a bar-aligning-member support which precludes the necessity of the bar's passing through the passageways 39 and 42 in the braces 24 and 29. The longitudinal brace 31 will accommodate the insertion of the additional stakes 37*a*.

In the use of the device the side form is positioned in the conventional manner with the base 11 thereof resting upon the upper surface of the subgrade 38. The stakes 37 will be inserted into the apertures 35 of the supports 24 and the apertures 36 of the base 11 and driven into the subgrade 38 to anchor the side form in proper position. The additional stakes 37*a* may then be inserted into the openings 50 in the flange 32 of the brace 31 and the base 11 of the form and driven into the subgrade to provide additional anchoring means.

The dowel bars 41 will then be inserted into the openings 40 of the brace 31, the passageways 39 of the supports 24 and the tubular members 19 so that substantially half of the length of each bar 41 will extend outwardly of the vertical web 10 of the side form. Other bars 41 will be inserted through the sleeves 46 so that substantially half of the length of each bar extends outwardly beyond the vertical web 10. The smooth bars 41*a* will be inserted into the openings 51 in the flange 33 of the brace 31, the web 10 of the form and the wall 16 of the grooving strip so that substantially half of the length of each bar 41*a* will extend outwardly of the vertical web of the side form. The bars 41 and 41*a* will now be supported in their proper elevated positions.



The concrete for forming a slab 48 will then be poured in the conventional manner and permitted to harden or semi-harden. The side form will then be removed or stripped from the bars 41 and 41*a* by first withdrawing the stakes 37 and 37*a* and then laterally removing the side form from the slab 48. It will be noted particularly from Figures 6, 7 and 8 of the drawings that the bars 41 have on their outer surfaces protuberances or lugs 49 which are arcuate. The lugs 49 are shown as arranged in two longitudinal rows which are angularly offset from one another and the lugs of each row are longitudinally staggered with respect to one another.

The edges of the openings 20 and 44 of the vertical web 10 and the openings 21 and 45 of the vertical wall 16 are raw or sharp. These sharp edges would preclude the possibility of the side form and the grooving strip being moved laterally during the stripping operation without damage to the concrete slab or to the form structures. The provision of the tubular members 19 and the sleeves 46 cover the sharp edges of the openings so that the bars 41 and especially the lugs 49 thereof are prevented from contacting these sharp edges. The side form and the grooving strip are therefore easily stripped from the bars 41 without damage to the bars, the concrete or the forms.

When the side form has been stripped from the bars 41 and 41*a* substantially half of each bar will extend outwardly from the concrete slab 48, as can be seen particularly in Figure 2 of the drawings, and the side form may be set up so that a second concrete slab may be poured around the exposed portions of the bars 41 and 41*a*.

The tubular members 19 and the sleeves 46 will not only function to permit easy stripping of the form from the bars 41, but will also support the bars in proper elevated position and will serve as braces and reinforcing means for the side forms. They will also prevent the soft concrete from passing through the openings in the grooving strip and filling up the inside of the grooving strip and will secure the grooving strip to the web 10.

It will be observed that these bars 41 may be five feet in length and that approximately thirty inches of this length will have to pass through the openings of the side form and the grooving strip during the stripping operation. In other words, the side form and grooving strip will have to strip over approximately thirty inches of the free end of the bar in order to entirely release the form from the edge of the roadway. Furthermore, it should be understood that in some cases there are four of these bars—two to the ten foot section of the road form. Sometimes it is specified that these bars be spaced as close as twelve inches. Therefore, whatever resistance there is to stripping the form over one bar may be multiplied twenty to fifty times. However, with the use of the tubular members 19 and the sleeves 46 of this invention the resistance to stripping will be negligible. Where the dowel bars 41 are provided with lugs 49 as shown in Figures 7, 8 and 9, the sleeves 19 and 46 are particularly useful in that the lugs 49 would be apt to catch against narrow openings such as the opening 20 in the web 10 and the opening 21 in the wall 16. The tubes 19 and 47 afford sufficient axial elongated bearing

surfaces so as to receive two or more of the lugs **49** which tends to axially stabilize the dowel bars **41**. This is especially true in the staggered form of the lugs **49** shown in Figure 7 as the axial distance between staggered lugs **49** on opposite sides of the dowel bars is sufficiently short so that proximate lugs **49** are contained simultaneously even in the short sleeve **19**. Of course a great number of the lugs **49** are simultaneously housed within the longer sleeve **46** as shown in Figure 4.

It has been discovered in dismantling old concrete structures that when dowel bars are placed in position and the concrete poured, as described above in the use of the improved side form, there is honey-combing or voiding of the dowel, as indicated in Figure 11 of the drawings. In this Figure 11, **41** represents the dowel when placed in position and thereafter concrete **48***a* has been poured over the dowel resulting in the honey-combing of the concrete immediately under the dowel, as indicated at **41***c*. It will be noted that this voiding destroys the value of the dowel bearing and depreciates the stability of the structure and weakens the load transfer efficiency of the dowel. The dowel bars may be vibrated into the plastic material to avoid this honey-combing of the concrete around the bars.

Figures 5 and 10 illustrate the method of installing the dowel bars after the concrete has been poured and before the concrete sets or hardens. The usual method of installing dowel bars has been to stake the dowel or tie bar in position some times by method of wiring or otherwise, an expensive or slip-shod method of positioning the bar which is insecure and expensive. With the tubular supporting members **19** and **46**, as illustrated, it is important to pour the concrete as indicated at **48** and while the concrete is yet plastic to force the dowel bar through the tubular supporting member. Sometimes these dowel bars are as much as two inches in diameter so in order to preclude the possibility of the concrete flowing into the large opening in the large tube **46**, which would be approximately 2⅛" in diameter, the practice would be to position the dowel bar into the tube with the end of the dowel bar flush with the inside of the form where it contacts the concrete as indicated at **41***b*. This would block the concrete from entering into the tube and after the concrete has been poured, and while it is yet plastic, force the dowel bar through the tube support and into the plastic concrete for the desired distance. The same procedure may be followed in installing the bars through the tubular members **19** and the openings **51**.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:

What I claim is:

1. A dowel bar supporting form comprising a side form having a vertical web, a grooving strip, a tubular member securing said strip to said web, said tubular member having a smooth through bore for receiving therethrough a dowel bar, and a support carried by said form and having a through passageway in alignment with the bore of said tubular member for receiving therethrough the dowel bar.

2. A dowel bar supporting form comprising a side form having a vertical web, a grooving strip, a tubular member securing said strip to said web, said tubular member having a smooth through bore for receiving therethrough a dowel bar, a support carried by said form and having a through passageway in alignment with the bore of said tubular member for receiving therethrough the dowel bar, said support and said form having aligned apertures therethrough for receiving a stake adapted to be driven into the subgrade for anchoring said form.

3. A dowel bar supporting side form for an airport runway or the like comprising a base for resting upon the subgrade, a substantially vertical web on said base, a grooving strip, said web and grooving strip having a series of pairs of horizontally aligned openings, a tubular member extending through each pair of aligned openings and having their opposite ends extending beyond said web and said grooving strip, the extended end portions being rolled over to provide lips for engaging said web and grooving strip for securing the grooving strip to said web, and a series of horizontally spaced apart supports disposed in alignment with said tubular members and secured to said base and web, each support having a through passageway in alignment with the bore of one of said tubular members, whereby a dowel bar may be received and supported by each tubular member and its associated passageway.

4. A dowel bar supporting side form for an airport runway or the like comprising a base for resting upon the subgrade, a substantially vertical web on said base, a grooving strip, said web and grooving strip having a series of pairs of horizontally aligned openings, a tubular member extending through each pair of aligned openings and having their opposite ends extending beyond said web and said grooving strip, the extended end portions being rolled over to provide lips for engaging said web and grooving strip for securing the grooving strip to said web, a series of horizontally spaced apart supports disposed in alignment with said tubular members and secured to said base and web, each support having a through passageway in alignment with the bore of one of said tubular members whereby a dowel bar may be received and supported by each tubular member and its associated passageway, each support having an aperture therethrough, said base having a series of apertures one of which is in alignment with the aperture in each of the supports, each of said pairs of aligned apertures adapted to receive therethrough a stake for anchoring the form to the subgrade.

5. A dowel bar supporting side form for an airport runway or the like comprising a base for resting upon the subgrade, a substantially vertical web on said base, a grooving strip, said web and grooving strip having a series of pairs of horizontally aligned openings, a tubular member extending through each pair of aligned openings and having their opposite ends extending beyond said web and said grooving strip, the extended end portions being rolled over to provide lips for engaging said web and grooving strip for securing the grooving strip to said web, a series of horizontally spaced apart supports disposed in alignment with said tubular members and secured to said base and web, each support having a through passageway in alignment with the bore of one of said tubular members, whereby a dowel bar may be received and supported by each tubular member and its associated passageway, and a brace secured to said supports and having an opening in registry with the passageway in each support for the reception of the dowel bar.

6. A dowel bar supporting side form for an airport runway or the like comprising a base for resting upon the subgrade, a substantially vertical web on said base, a grooving strip, said web and grooving strip having a series of pairs of horizontally aligned openings, a series of horizontally spaced apart supports secured to said base and web and each having a through passageway in alignment with each pair of openings in said web and strip, and a sleeve extending through each pair of aligned openings and passageway and secured to said web and said strip for receiving and supporting a dowel bar.

7. A support for dowel bars comprising a side form having openings, tubes lining the openings and having smooth bores to receive the dowel bars, supports in the form having dowel bar openings alined with said tube, and a brace spanning the supports and also having dowel bar openings alined with the tubes and first-named openings.

8. A dowel bar support comprising a side form, a form support therein, a brace for the form support, and a tube lying through said form, support and brace for slidably receiving a dowel bar therethrough.

9. A dowel bar support comprising a side form, a grooving member thereon, a form support in the form, a brace for the form support, and a tube lying through said form, grooving member, support and brace for slidably receiving a dowel bar therethrough.

10. A dowel bar support comprising a side form, spaced supports in the form, a brace connecting said supports, said form, supports and brace having aligned openings for dowel bars, and said form and brace between the supports having other aligned openings to receive dowel bars, and tubes lining the openings and having smooth bores therethrough.



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