The present invention relates to improvements in removable expansion joint forms and has for an object to provide a removable expansion joint plate or form for molding a space between abutting slabs of concrete, such space to be subsequently poured with an asphalt or other filler.

It is to be understood that the improved expansion joint plate or form is for use in concrete roads, floors, roofs, walls, and similar plastic structures.

It is another object of the invention to provide an improved expansion joint form of a pliable nature which will admit of the same fitting closely about the dowel rods, and also permitting of the ready removal of the form from such dowel rods.

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

In the drawings, in which like reference characters indicate like or corresponding parts throughout the several views.

Figure 1 is a fragmentary perspective view, with parts broken away and parts shown in section, of a concrete roadway showing the application and method of removal of expansion joint forms constructed in accordance with the present invention.

Figure 2 shows a perspective view of a modified form of the invention.

Figure 3 is a section taken along the line 3--3 in Figure 2.

Figure 4 is a fragmentary perspective view of a staking or supporting arrangement for the form.

Figure 5 is a cross sectional view taken through a modified form with a single reinforcement plate.

Figure 6 is a fragmentary perspective view showing a further modification.

Figure 7 is a similar view showing a still further modified form.

Figure 8 is a fragmentary sectional view taken through a coated and capped dowel rod and

Figure 9 is a perspective view of an implement employed for withdrawing the forms.

Referring now particularly to Figure 3, 10 designates a concrete roadway under construction, to which are applied certain of the improved forms.

These forms are made up generally of steel or other reinforcing plates 11 and 12 which are placed upon opposite sides of a pliable mat or filler 13, preferably of rubber. The reinforcing plates 11 and 12 are cut away or notched, as indicated at 14, exposing the rubber filler 13 and for admitting the dowel rods 15. At the exposed portions of the rubber filler 13, the same is provided with slots 16 which terminate in the openings 17 for receiving the dowel rods 15.

Preferably the openings 17 are made somewhat smaller than the diameter of the dowel rods 15 to insure that the rubber filler will hug the dowel rods snugly.

The dowel rods, as shown at 15a in Figures 1, 10 and 8, may be dipped in a solution of asphalt or tar before they are put in place to prevent such dowel rods from bonding to the concrete; and the dowel rods are also preferably provided with rubber caps, as shown in Figure 8, or other suitable means, on their ends so as to prevent compression of the dowel rods when the abutting concrete slabs expand.

The rubber filler 13 will support the dowel rods 15 securely in position; but the ends of the dowel rods may be further supported, if desired, by other suitable means well known in this art. The rubber filler 13 is held in position between the reinforcing plates 11 and 12 by appropriate fastenings, for instance by the countersunk pins or rivets 18, such fastenings being provided in suitable number and being appropriately spaced.

The side form is indicated generally at 19 and is held in place by the stakes 20. The particular side form shown has a tubular upper portion consisting of the top tubular tread 21 and the bottom tubular wall or member 22, the parts 21 and 22 being spaced apart to receive sidely therebetween the wedges 23. Such wedges are provided, with striking lugs 24, which project out through openings or slots 25 made in the tubular portion of the side form. The function of the wedge 23 is to bind the stakes 26 and the side forms together.

It will be noted that this type of side form has no base flange, and as constructed, it is found convenient for use in the construction of floors and roofs, and in some instances has been found very efficient for the construction of roads, inasmuch as concrete or earth shoulders 26 may be built on each side of the form, and the form 19 may be later lifted out of position after the materials have been poured and screeded, using the top surface 31 of the side form as a screed line.

The rubber filler or mat 13 preferably projects beyond the ends of the reinforcing plates 11 and 12 so that the rubber contacts snugly with the web of the side form 19 whereby to produce a separation of the concrete slabs. This projection of the rubber mat 13 beyond the reinforcing side...
plates 11 and 12 will also compensate for slight variations in the spacing of the side forms 10, that is, in actual practice, it is found that side forms on eighteen foot roads are some times spaced seventeen feet between the side forms; consequently, the extended rubber ends, being pliable, will permit these plates or joint forms to be forced between the closely placed side forms. It will also be noted from Figure 1, that the

reinforcing side plates 11 and 12 preferably terminate short of the lower edge of the rubber mat or filler 13 whereby to give this free lower edge of the rubber filler an opportunity to conform to the irregular line of the subgrade. In the center of the roadway, the general practice is to install mechanical or other types of longitudinal joints, such as indicated generally at 27. These joints are installed either before or after the concrete is poured. The rubber filler 13 will project into this joint space, but the rubber, being pliable, will permit the movement of a blade or other mechanical joint installing means and will produce a clean separation between the slabs at the line of the joint. As shown in Figure 1, the joint plate illustrated is of a length only half the width of the road. It is understood that two such joint plates are required, which may be fitted together in alignment with the reinforcing ends of the rubber fillers of the two plates may meet together to provide a complete separation, but, due to pliability, the rubber will readily yield to the movement of the joint installing means and to the joint itself.

In the fore portion of Figure 1, the expansion joint forms are shown as being in place, while to the rear, one of the expansion joint forms is shown partially raised from the concrete roadway. The raising of the form may be achieved by any appropriate means, for instance by use of the implement shown in Figure 9, which implement is engaged in openings or holes 28 made in the reinforcing plates 11 and 12 of the form, preferably at the upper corner portions thereof. The implement is provided with prongs or pins 29 or 28, which prongs or pins 29 are carried upon a shank 30 and the shank 30 is in turn connected with the handle 31.

In the use of the device, the improved expansion joint form is initially put in place upon the subgrade as indicated in Figure 1, if being desirable to oil the outside surfaces of the form and also to saturate the rubber mat or filler 13 with an oil or other suitable material calculated to exclude water and foreign matter from entering into the porous rubber or between the plates 11 and 12 supporting the rubber 13. The improved expansion joint form may be held in position by any appropriate means, for instance by that shown in Figure 4, which will be hereinafter more fully described. The concrete is thereupon poured to both sides of the improved form, the form constituting a division plate which will secure a separation between adjacent slabs of the concrete roadway or other concrete construction allowing for contraction and expansion between the slabs. It is to be understood that the improved expansion joint form may be removed after the concrete has taken its initial set; or the form may remain in position until the concrete has hardened, and the form, being resilient or compressible, may be withdrawn from the concrete after the concrete has hardened and taken its final set. The improved expansion joint forms, being thus removable, are subject to reuse over and over again.

It will be understood that, in raising the improved form, the hook member or implement 29, is inserted in the openings 28 of the form and the form is raised out of position, as indicated in Figure 1. This is accomplished without dislocating or interfering with the dowel rods 15e, which as previously stated have been coated with tar or other preparation to keep same from bonding with the concrete.

The dorr anty bars are of course embedded in the concrete and remain embedded while the improved expansion joint form is removed therefrom. This removal is made possible by the adaptability of that portion of the rubber mat or filler 13 which lies adjacent to the slots 16 and is exposed by the cut away portions 14 of the reinforcing plates 11 and 12. In pulling the form out, the rubber lying adjacent the slots 16 spreads out, as indicated in Figure 3, and also at the left in Figure 2, allowing the form to be pulled up from the line of the joint dowel rods passing out through the restricted slots 16. The rubber or other material of which the mat or filler 13 may be made, being of a resilient or pliable nature, will close the slots 16, as indicated in the rear portion of Figure 1 after the device has been raised, whereby the form will be in condition for repeated use.

Referring more particularly to Figure 2, there is here represented an expansion joint form for extending the full width of the roadway. This form is provided with a central slot or cut away portion 32 in its upper edge into which the rubber filler 13 preferably projects. This slotted portion is formed for use in those cases where mechanical joints are to be installed in the center line of the roadway.

The resilient rubber lying beyond the cut away portion 32 of the reinforcing plate will permit the mechanical grooving blade or other joint producing material to be passed through the form unobstructively.

This Figure 2 illustrates a device for use where a curb construction is used. If desired, an extension removable curb expansion form may be placed over the top of the standard removable joint form as indicated. This extension form may be formed by the application of reinforcing plates 33 and 34 to opposite sides of the rubber or other pliable filler 35 which projects beyond the edges of the plates 32 and 34. The plates 33 and 34, however, preferably extend below the rubber filler block 35 in order to overlap the form below to properly seal and hold the curb extension in place upon the standard form. The extension form will be adjustable up and down to the proper elevation; and will also serve as a curved line for shaping the contour of the curb.

This Figure 2 further shows at the extreme left, one of the dowel rods in the act of passing through the slots 18, indicating the bulging of the pliable rubber therewith to permit its passage; and a second dowel rod is also shown in this figure as just having been removed completely from the rubber filler 13, indicating how the rubber filler is restored to its initial position by virtue of its inherent resilience.

Referring now more particularly to Figure 4, I have here shown one form of a staking arrangement which may be used with the improved expansion form whereby to hold the latter in
vertical position while the concrete is being poured.

This staking device includes a plate member 36 having a slot 37 open through its bottom

whereby to receive the form. This plate 36 is notched, as indicated at 38 to receive the wedge
39 which is adapted to be driven in to bind the form in the slot 37. At 40 is indicated the stake
which is driven into the subgrade. This wedge
39 supports the form securely within the slot 37
while the concrete is being poured. It is under-
stood that after the concrete has been poured
and spaded on both sides of the form sufficiently
to hold the form in position, the supporting mem-
bers or staking arrangement may be removed
from the concrete and used over and over again.

As shown in Figure 4, 13a represents a metal
stiffener bar, which may be either riveted or
welded between the plates 11 and 12. This metal
bar will reinforce and stiffen the joint member
against lateral movement, which will produce a
strait-hght Joint.

In Figure 5, I have shown a modified form of
device in which the rubber mat or filler 13x is re-
inforced at only one side thereof by a steel or
other plate 11a, the other side of the filler being
left entirely free. The fastenings 18a are pre-
carably countersunk as in the previous figures to in-
sure a smooth surface. The plate 11a is prefer-
ably of slightly less length than the
filler 13x. Referring more particularly to Fig-
ure 6, I have herein shown a removable rubber
joint form made of rubber of a harder consist-
ency, indicated at 13b, in which the side or lateral
reinforcements are dispensed with and only a
metal reinforcing cap 41 is used which extends
over the upper edge of the rubber 13b. This cap
41 of metal or other material may be perma-
ently secured to the rubber by means of rivets
or other appropriate fastenings, indicated at 42.
The mat of rubber 13b has slots 16b and openings
17b therein to receive the dowel rods and to per-
mit the stripping of the rubber joint form over
the dowel rods, as previously explained.

As shown in Figure 7, a removable rubber joint
form is shown as consisting of a hard rubber mat
13c having inserts therein of a soft rubber com-
position, for instance of sponge rubber vulcanized
or otherwise secured to the hard rubber and for
containing the slots 18c and the openings 17c to
receive the dowel rods and permit the stripping
of the rubber joint device from the dowel rods.

As shown more particularly in Figure 8, a por-
tion of one of the dowel rods 15 is indicated as
being covered with a film or coating of tar or
other suitable resilient cap 44 is also indicated as
secured over the ends of the rods.

2. A removable road joint form comprising a
resilient member, side reinforcing plates for the
member, the member being longer than the
plates to permit positioning of the form within a
space less than the length of the resilient mem-
ber.

3. A removable joint form comprising a plate
having cut away portions to receive dowel rods,
and a resilient mat secured to the plate having
holes terminating at the cut away portions to ex-
tend about the dowel rods.

4. A removable joint form comprising a sub-
stantially resilient mat, a reinforcing cap posi-
tioned over the top edge of said mat and secured
thereto, said mat having holes therein to receive
dowel rods and slits extending from said holes
and terminating at the bottom of the mat to
permit stripping of the mat over the rods when
withdrawing the mat from the finished concrete.

5. A removable expansion joint form compris-
ing a cushion member, and steel plates for sup-
porting said cushion member to mold a separa-
tion in road slabs, and a curb expansion joint
form to seat on said firstnamed form.

6. A removable expansion joint form compris-
ing a pliable mat capable of being elongated or
compressed, said mat having holes to receive
dowel rods and slits extending from said holes
to the bottom of said mat to permit stripping of
the mat over the dowel rods to remove the form.

7. A removable expansion joint form compris-
ing a form member having holes for dowel rods
and slits leading to said holes for permitting of
stripping of the member from the dowel rods, said
member having pliable portions extending about
said holes and slits.

8. A removable road joint form comprising a
longitudinally reinforced resilient mat.

9. A removable road joint form comprising a
resilient mat longitudinally reinforced at the up-
per edge thereof.

10. A removable expansion joint form compris-
ing a partition member of rigid material provided
with an edge opening recess adapted to receive
a road section connecting member in stranded
relation, and means carried by said partition
member for closing the recess about a road sec-
tion connecting member when engaged there-
with.

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