Nov. 30, 1943. S. S. COLT 2,335,236

REINFORCED SHIELD FOR FORM WALL TYING MEANS

Filed Feb. 14, 1942 2 Sheets-Sheet 1

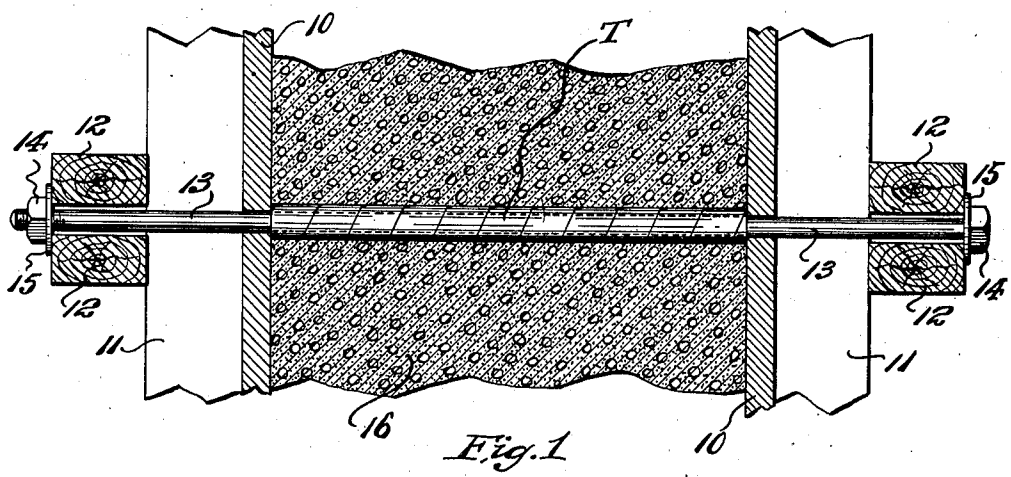



Fig. 1

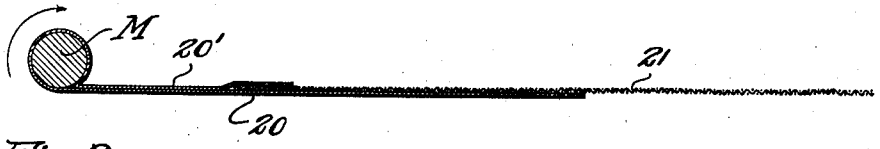
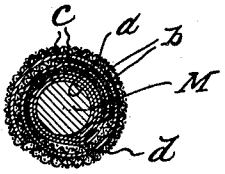



Fig. 2

Fig. 3



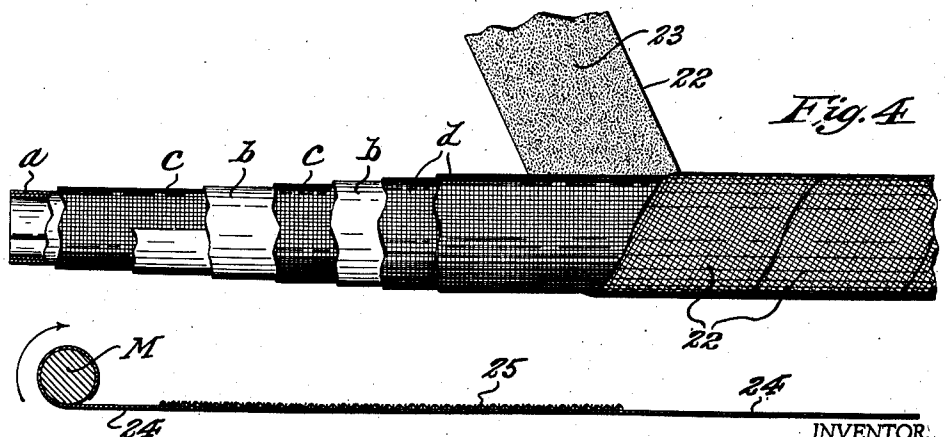




Fig. 4

Fig. 5

INVENTOR.
Samuel S. Colt,
BY George D. Richards,
ATTORNEY.

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REINFORCED SHIELD FOR FORM WALL TYING MEANS

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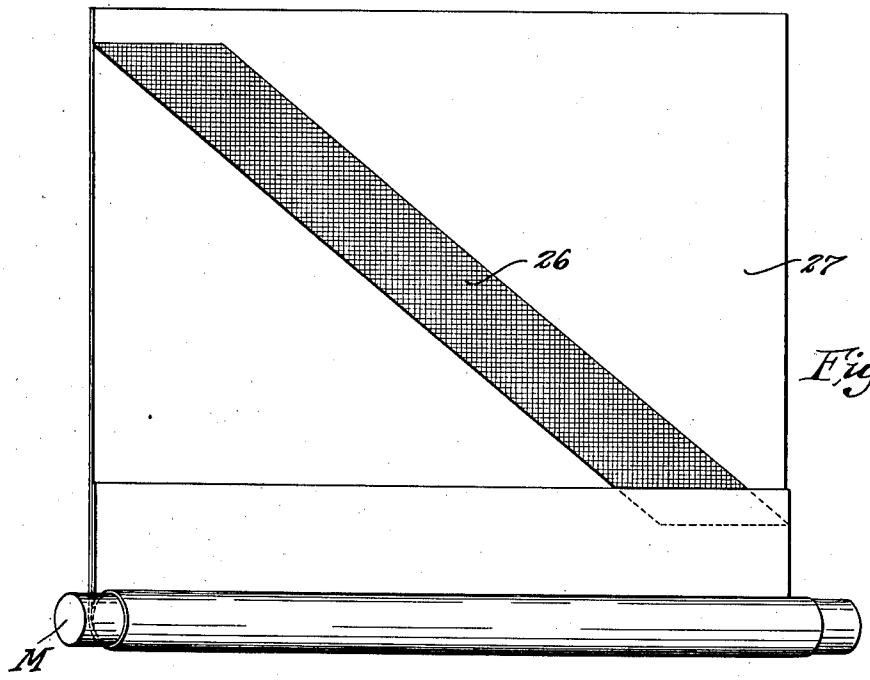



Fig. 6

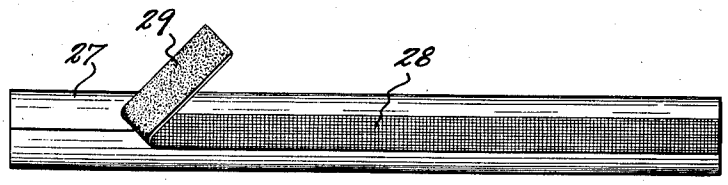



Fig. 7

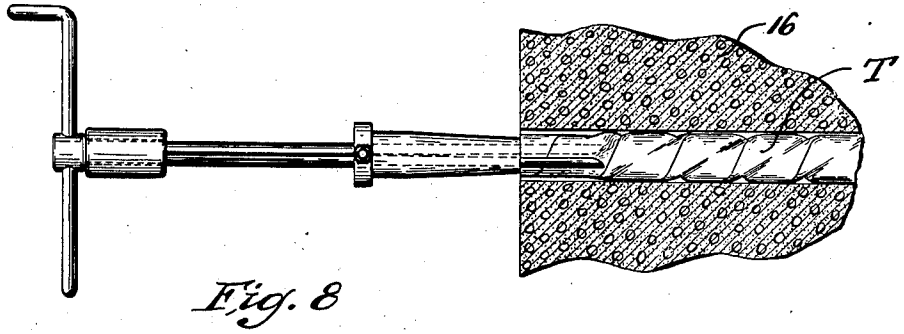



Fig. 8

INVENTOR.
Samuel S. Colt,
BY George D. Richards
ATTORNEY.

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# UNITED STATES PATENT OFFICE

2,335,236

## REINFORCED SHIELD FOR FORM WALL TYING MEANS

Samuel S. Colt, West Orange, N. J.

Application February 14, 1942, Serial No. 430,856

3 Claims. (Cl. 138—78)

This invention relates to improvements in means for retaining the walls of concrete forms in place preparatory to casting concrete therein; and the invention has reference, more particularly, to improved means for shielding tie-rods and other interiorly disposed parts of form wall tying means against contact with the concrete poured into the form; said improved shielding means being generally of the same kind and for the same purposes disclosed in my copending application for United States Letters Patent Ser. No. 406,147, filed August 9, 1941.

The present invention has for an object to provide a novel construction of reinforced tie-rod shielding tube which is subject to lateral contraction by application of torsionally applied force thereto, after a tie-rod has been withdrawn therefrom, whereby it may be loosened from and then withdrawn out of the finished concrete mass, after the form in which the latter was cast is dismantled; the construction and reinforcement of the novel shield tube being such that, although readily contractible by twisting, it is not injured or destroyed by the twisting operation, and consequently, after being withdrawn from a concrete mass, may be easily reversely twisted and caused to resume its initial condition so that repeated use thereof may be made.

This invention has for a further object to provide a novel construction of reinforced shield tube for the purposes above mentioned which is easily and quickly made from low cost materials, either individually on the job as required, or in quantity in advance; said shield tube being so made as to be substantially waterproof or moisture resistant when contacted by wet poured concrete in use.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of this invention are shown in the accompanying drawings, in which:

Fig. 1 is a fragmentary vertical section through a form showing its wall tying means and one form of reinforced shield tube in covering relation to interiorly disposed parts of said tying means, said shield tube being also arranged to function as a spreader means between the opposed form walls.

Fig. 2 is a longitudinal sectional view showing an initial step in the method of producing one form of the novel reinforced shield tube of this invention; Fig. 3 is a transverse sectional view showing the formation of the body portion of said shield tube; and Fig. 4 is a fragmentary elevational view of said shield tube completed, parts thereof being successively broken away to show underlying structure.

Fig. 5 is a view similar to that of Fig. 1, but showing a modified form of reinforced shield tube in the making.

Fig. 6 is a plan view showing an initial step in the method of producing another modified form of the reinforced shield tube according to this invention; and Fig. 7 is an elevational view of the same completed.

Fig. 8 is a fragmentary vertical sectional view through a cast concrete mass, showing application to the shield tube of a tool or torsionally contracting and removing the same from said concrete mass.

Similar characters of reference are employed in the hereinabove described views, to indicate corresponding parts.

In the drawings, the reference character 10 indicates the opposed walls of a concrete form, to the exterior faces of which are applied, in suitably spaced apart relation, the uprights or battens 11, across the exterior faces of which extend pairs of spaced walers 12.

The form wall retaining or tying means comprises a tie-rod 13 of suitable length adapted to extend transversely through the form interior to project outwardly through the respective form walls 10, and between the spaced walers 12 associated therewith. The tie-rod 13 is held against displacement by heads or nuts 14 and associated washers 15 with which the ends thereof are provided, and which bridge and abut the outer faces of the adjacent pairs of walers 12.

Associated with that portion of the tie-rod 13 which is disposed interiorly of the form, so as to cover the same, and so as to extend between the form walls 10, preferably in spreading relation thereto, is a reinforced shield tube T according to this invention, the same serving to protect or shield the tie-rod from contact by the concrete mass 16, when the latter is cast in the form.

The novel reinforced shield tube T, in one illustrative form thereof as shown in Figs. 2, 3 and 4, is made up as follows:

To form the main body of the shield tube, a sheet 20 of flexible sheet material of suitable length and of a width to produce a desired length of completed shield tube is provided. Preferably this material comprises a sheet of tough paper, and especially a paper suitably treated to render the same substantially water-proof, or at least water resistant. By one method of manipulation, the sheet 20 is lapped around a forming mandrel

M of selected diameter adapted to determine a desired internal diameter for the completed shield tube; thus providing a superposed inner lap ply 20' at one end of the sheet 20. Overlaid upon that portion of the sheet 20 which extends outwardly from the lap ply 20' is a flexible reinforcing member 21, which, in the illustrative form of shield tube shown in Figs. 2, 3 and 4, preferably comprises a sheet of textile fabric of a width corresponding to the width of sheet 20, and of a length to extend suitably beyond the free outer margin of said sheet 20. The inner end of said reinforcing member 21 is disposed to be lapped by the free marginal end portion of the inner lap ply 20' of said sheet 20, so as to be gripped between said lap ply 20' and the underlying portion of said sheet 20. While I have specified that the reinforcing member preferably comprises a sheet or ply of a textile fabric, I do not necessarily limit myself to such specific material, since other tough and flexible sheet materials, which will yield to torsional force and resulting twisting without fracture or disruption, may be utilized; such e. g. as a thin sheet of natural or artificial rubber or like plastic material; a natural or artificial parchment or like membranous material; or even a light weight metallic mesh fabric or hardware cloth. From the standpoint of economy, however, a textile fabric provides the most satisfactory reinforcing material.

The sheet 20 and reinforcing member 21 having been relatively disposed as above described, the mandrel M is rotated to roll the same into a tubular body formation, as shown in Fig. 3. As thus formed, said body formation will possess interior portion *a* solely comprising convolute plies of paper, an intermediate portion comprising alternated convolute plies of paper *b* and reinforcing material *c*, and an outer portion *d* solely comprising convolute plies of reinforcing fabric (see Figs. 3 and 4). The contiguous convolute plies thus formed are preferably free for relative movement, i. e. the same are not adhered together, or at least the interior plies are no so adhered, although, if desired, the outer plies *d* of reinforcing fabric may be adhered together.

After the body formation is produced, the same is finished by application of a cover means to and around its exterior surface, said cover means being adhesively secured to the body formation by a flexible water-proof adhesive, such e. g. as a latex base adhesive substance. In preferred form, said cover means comprises a strip or band 22 of textile fabric coated on its inner or under face with the adhesive 23. Said strip or band 22 is helically wound over and around the body formation so as to be strongly united or bound thereto; thus not only serving to retain the body formation in the required tubular form, but also so as to provide a moisture impervious protection therefor.

It will be obvious that the included plies of reinforcing material with which the body formation is provided will strongly support the paper material, when torsional stresses are applied to the shield tube, so that risk of disruption or fracture of the paper material when twisted is eliminated, and yet the desired lateral or diametric contraction of the shield tube under torsionally applied force is assured.

The shield tube structure may be optionally produced in somewhat modified forms. For example, the reinforcing material may be limited in location to points within the shield tube wall structure intermediate the inner and outer parts of the latter. One manner of effecting such arrangement is shown in Fig. 5, wherein a sheet of paper 24 of suitable length and width is provided, and a sheet of reinforcing fabric 25 of corresponding width but of less length is superposed upon the paper sheet intermediate its ends, and then the thus assembled sheets rolled upon a mandrel M into the tubular body formation; the latter being completed by winding of the adhered cover strip or band 22 therearound.

Another form of incorporated reinforcing material as shown in Fig. 6, may comprise, a band, strip or length of reinforcing fabric or other reinforcing material 26 superposed diagonally on the body sheet 27 of paper or like flexible sheet material, and the assembly then rolled into tubular form around the mandrel M, whereby the tubular body formation will be formed wherein the reinforcing element extends helically along the length thereof intermediate the convolutions of the body sheet. The tubular body formation in such modified form is likewise completed by winding of the adhered cover strip or band 22 therearound.

As an alternative to the provision of the helically wound and adhered external cover strip or band 22, a cover element or strip 28 having a coating of adhesive 29 on its inner face may be applied over the margin of the outer convolute ply of the body formation to secure the same against displacement (see Fig. 7); or, if desired, such applied cover strip or band may be of sufficient width to entirely encircle the exterior surface of the tubular body formation.

When the concrete mass 16 is cast into the form interior so as to be shaped thereby, the internally disposed parts of the tie-rod 13 are protected from contact with the cast concrete by the enveloping shield tube T, and consequently the cast concrete mass is prevented from adhering to the tie-rod. After the cast concrete has set, the form may be dismantled by removing a detachable nut and washer 14—15 from a tie-rod end, thus freeing the tie-rod for withdrawal, after which the form walls, with their battens and walers, may be stripped away from the faces of the cast concrete mass. It will be obvious that due to the enveloping shield tube T and its protective effect upon the tie-rod 13, the latter may be easily withdrawn without risk of injury thereto, and, consequently, it and all cooperating parts of the form retaining or tying means may be salvaged one hundred per cent, subject to repeated use over and over again.

After the form walls have been stripped away, the extremities of the shield tube T will be exposed at the faces of the concrete mass. To manipulate and extract the shield tube T, an end thereof is engaged by a suitable tool, such e. g. as a special tool designed for the purpose which is fully disclosed in my copending application for United States Letters Patent Ser. No. 408,309, filed Aug. 26, 1941, whereby the wall of the shield tube may be gripped. When the tool is thus operatively applied to the shield tube T (see Fig. 8), the tool is rotated about its longitudinal axis, whereby torsional force is applied to the shield tube so that the latter is twisted in such manner that it is contracted diametrically, thereby shrinking its outer surfaces away from the contiguous surfaces of the surrounding concrete mass, and thereby freeing the shield tube so that it may be longitudinally withdrawn bodily from the concrete. After such withdrawal of the

shield tube T, the outwardly open voids left thereby in the concrete may be plugged and pointed up in the customary manner.

When the shield tube is of the reinforced and water resistant character in accordance with the instant invention, the twisting distortion thereof, which occurs during its removal from a concrete mass, while effective to diametrically contract the same subject to such removal, will do no permanent injury thereto, since the reinforcement material so supports the paper or like body sheet as to prevent disruption or fracture thereof, and yet will permit that relative movement or slip of the helical plies of the paper or like body sheet, particularly the innermost of said plies, which facilitates the required diametric contraction of the shield tube. I have found, that, after the twisted and contracted shield tube T has been removed, it may be readily reversely twisted and thus brought back to its normal initial cylindrical formation ready again for repeated use. To accomplish such reconditioning for re-use, a tapered mandrel (not shown) is inserted into the bore of the twisted shield tube, and thereupon the tube body is reversely twisted as it is worked onto such mandrel, with the effect of removing therefrom its torsional deformation, and bringing the same back to the substantially smooth cylindrical form of its initial condition, ready for re-use.

It will thus be apparent that the novel reinforced shield tubes T, may be used over and over again, and consequently in addition to economy involved in the saving of metallic forming tying elements which is effected by use of the shield tube, a substantial additional economy is attained by reason of the ability to recondition the shield tubes themselves subject to repeated use.

I am aware that various changes, other than those specifically mentioned, could be made and many apparently widely different embodiments of this invention could be made without departing from the scope thereof as defined in the hereafollowing claims; hence, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A shield tube for the purposes described comprising a body sheet of tough, moisture resistant paper and a reinforcing member of textile fabric assembled therewith in superposed relation thereto so as to cover part of the area thereof, said assembly being rolled upon itself into a tubular body formation having a wall structure comprising a central part formed by alternated plies of paper and reinforcing fabric and an inner part formed by paper alone, and a cover member comprising a strip of woven fabric spirally wound on and about said body formation from end to end thereof and adhered to the surface of the latter by a waterproof adhesive, the assembly providing a tubular body adapted to contract diametrically under applied torsional stresses.

2. A shield tube for the purposes described comprising a body sheet of tough, moisture resistant paper and a reinforcing member of textile fabric assembled therewith in superposed relation thereto so as to cover part of the area thereof, said assembly being rolled upon itself into a tubular body formation having a wall structure comprising a central part formed by alternated plies of paper and reinforcing fabric and an inner part formed by paper alone, and a cover member comprising a strip of woven fabric spirally wound on and about said body formation from end to end thereof and adhered to the surface of the latter by a waterproof adhesive, the margins of contiguous convolutions of said cover strip being disposed in closed abutting relation, the assembly providing a tubular body adapted to contract diametrically under applied torsional stresses.

3. A shield tube for the purposes described comprising a body sheet of tough, moisture resistant paper and a reinforcing member of textile fabric assembled therewith in superposed relation thereto so as to cover a part of the area thereof but to extend beyond an end thereof, said assembly being rolled upon itself into a tubular body formation having a wall structure comprising a central part formed by alternated plies of paper and textile fabric, an inner part formed by paper alone, and an outer part formed by textile fabric alone, the assembly providing a tubular body adapted to contract diametrically under applied torsional stresses.

SAMUEL S. COLT.