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Description

Background of invention

(a) Field of the invention

The present invention relates to an improved structural pole construction, particularly, but not exclusively, for use in transmission lines. Particularly, the structural pole of the present invention is comprised of two upright metal channel members interconnected by diagonal structural bars extending serially across the channel members whereby the pole is resistant to eccentric loads.

(b) Description of prior art

Various structural pole constructions are known. For example, reference is made to CA—A—1,073,632 relating to a semi-lattice pole construction comprising opposed channel members interconnected by a plurality of cross-arm braces disposed on opposed sides of the channel members. It can be seen that such a structural pole requires many parts for its constructions, i.e., braces and bolts, and is time consuming to assemble.

GB—A—628 868 discloses a structural pole corresponding to the definition given in the preamble of Claim 1. However, in this known structure the main upright members are standard channels with a web and two flanges extending inwardly from a flat outer wall of the channels.

There exists the need to provide a pole structure which is economical to construct and assemble and requires very little parts whilst maintaining the structural integrity of such structural pole of the prior art referred hereinabove. There is also the need to provide such a pole structure whereby the assembly thereof can be done with the use of power tools. There is also a need to provide a pole which is smaller in cross-section than the known semi-lattice pole while retaining the same structural strength as the prior art pole thereby permitting more poles to be placed in a carrier such as a flat-bed truck, for transporting such poles to the installation site. Still further, there is a need to provide a pole which has a good aesthetic design and of a construction whereby not to generate eccentricity when subjected to loading.

Summary of the invention

It is an object of the present invention to provide an improved structural pole construction meeting all of the above-mentioned needs.

According to the above object, the present invention provides a structural pole comprising a pair of upright metal channel members having an elongated flat outer wall with inwardly extending tranverse structural flanges; said channel members being interconnected in substantially parallel relationship, with their flanges extending inwardly, by a series of inner braces interconnected together and to said outer walls and spanning diagonally across said channel members and disposed in a predetermined pattern throughout the lengths of the channel members; each said diagonal brace being an elongated structural angle-iron bar having flat angulated connecting ends having a through bore therein and securable to said channel members by overlapping said connecting ends of adjacent diagonal braces, and a fastener interconnecting each said overlapping connecting ends with said flat outer wall of said channels, characterised in that said structural flanges of said pair of channel members have a right angle inner lip extending inwardly and parallel to said flat outer wall, and said elongated structural angle-iron bars have right angle walls of equal width, said inner braces in at least a lower portion of said pole being interconnected diagonally across alternating sides of said channel members with an intermediate diagonal brace extending diagonally across opposed sides of the channel members and interconnected with the ends of the braces on alternating sides of said channel members, and a lower one of said pairs of interconnected channel members being provided with an elongated structural rib formed integral and disposed longitudinally in said flat outer wall.

Brief description of drawings

An example of the preferred embodiment of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a perspective fragmented view showing a structural pole of the present invention as used to support a transmission line mast;

Figure 2 is a fragmented section view of the structural pole;

Figure 3A is a cross-section view of the structural pole showing a centrally connected inner brace;

Figure 3B is a cross-section view of the structural pole showing offset and diagonally connected inner braces;

Figure 4 is a side view of a lower pole section; and

Figure 5 is a side view of the diagonal brace.

Description of preferred embodiments

Referring now to the drawings and more particularly to Figure 1, there is shown generally at 10 the structural pole of the present invention. The pole is comprised essentially of a pair of upright metal channel members 11 and 11′ which are interconnected in substantially parallel relationship by a plurality of inwardly disposed braces 12 extending diagonally along the length of the pole. As herein shown, the base 13 of the pole is secured in a concrete form 14 located beneath a ground surface 15. The top end of the pole 10 supports a transmission line mast 16. Of course, the pole can be used for a multitude of other applications and may be interconnected with like poles to form support columns.

Referring now to Figures 2 to 4, it can be seen that the channel members 11 and 11′ are formed steel channel members having an elongated flat outer wall 17 and transverse opposed structural flanges 18. The ends of the structural flanges 18

are provided with a right angled inner lip 19 extending inwardly and parallel to the flat outer wall whereby to provide more structural rigidity to the channel members. However, when assembling a pole with a plurality of interconnected channel members, the top ones of the channel members need not have flanges with inner lips 19 as they are subjected to less loading than the bottom channel members where more structural strength is required.

Referring additionally to Figure 5, the channel members 11 and 11' are interconnected in parallel relationship by a series of diagonally disposed inner braces 12 which are elongated structural bars, herein angle iron bars having a cross-wall 20 formed with right angle sections which are of equal width and form a right angle structure brace. The ends of the bars are flattened to form angulated connecting ends 22. The connecting ends are provided with one or two, herein one, through bore 23 which is centrally aligned with the apex 21 of the bar. The connecting ends 22 of each bar 12 is overlapped with a connecting end 22 of an adjacent bar (see Figure 2) and interconnected together by a fastener 24 which extends through aligned bores 23 of overlapped interconnecting ends 22 and a bore 25 provided in the outer wall 17 of the channels 11 and 11', respectively. Thus, a single bolt fastener secures opposed ends of diagonal braces 12 to the channels with the bars 12 spanning the structural channels 11 and 11' throughout the length of the pole. Therefore, any load on the poles will be transmitted to the connecting points (the bolt connection 24) disposed on opposed walls whereby the channels are not subjected to eccentric loads.

As shown in Figures 1 and 2, a pole is constructed by interconnecting two or more pairs of channel members 11 and 11' end-to-end by a telescopic overlap section, as illustrated at 27. The telescopic connection simply consists in providing a top pole section which is provided with like channel members 28 and 28', but of smaller size whereby to slide fit inside a top portion of the channels 11 and 11' respectively. A plurality of splice bolts 29 would then secure these overlapped ends together. Transverse cross braces 30 may also interconnect the channels 11, 11' and 28 and 28' together and solidify the splice. Also, the braces 12 are disposed such that a brace 12' spans the splice region 27 to strengthen the joint.

It is well known in the art that load on a support pole increases in the downward direction of the pole. This is the reason why wooden poles have a larger diameter at the bottom and taper to a smaller top diameter. The pole of the present invention is likewise made stronger at the bottom than at the top and this is achieved by interconnecting the braces 12 of the bottom channel members 11 and 11' in a pattern wherein the load is distributed at various transverse points across the channel members. This is achieved as shown in Figure 3B by alternating the disposition of adjacent interconnected braces 12. As herein shown, a brace 12' is connected diagonally between the two channel members 11 and 11' offset to one common side of the channel members. The next diagonal brace 12'' extends diagonally across opposed sides of the channel members while the next brace 12'' extends diagonally between the other common side of the channel members. This pattern provides for a stronger pole section by providing improved torsional resistance and preventing the side wall 17 from bowing out. Additionally, depending on the loading of the pole, an elongated reinforcing rib 31 may be formed in the outer wall 17 of the channel members 11 and 11' and located centrally thereof, whereby to strengthen the wall 17 and lower pole section.

The pattern of these braces 12 can vary along the length of the pole dependent of the number of pairs of channel members being interconnected end to end. For example, the upper sections of the pole may have all their braces interconnected along a common central plane 26 as illustrated in Figure 3A as this facilitates installation. Also, the flanges 18 of the top channel members need not have a right angle inner lip 19 as shown in Figure 3B, as this section of the pole is subjected to less stress. Some of the channel members 11 and 11' (those used in the top region of the pole) may also be provided with interspaced series of three holes 32 (see Figure 4) for attachment of the braces 12 in any desired abovementioned configuration. The space holes 32 may be used to attach auxiliary equipment to the pole, such as guy wires, transformers, platforms (not shown), etc.

It can be seen that with the structural pole construction just described that very few components parts are provided and particularly very few fasteners are requierd to interconnect the opposed channel members to one another through the diagonal bars. Also, with this construction there is no obstruction to opposed sides of the channel members and therefore power tools can be utilized from both sides of the channels to assemble the pole. Still further, auxiliary equipment, such as transformers, brackets, connectors etc., may be easily attached to these poles without obstruction. As previously mentioned, the pole is easier amd more quickly installed reducing the assembly cost thereof, and is easy to manipulate and install in a suitable footing. Also, experiments have demonstrated that poles can be strengthed by the configuration of the serially interconnected braces which span the opposed channel members internally of the pole. Because of the small surface area that the pole occupies, it is possible to assemble these in a plant and then transport many of these on a single flat-bed truck to the erection site. A still further advantage of this pole is that it is of more pleasing aesthetic design which is an advantage when a pole line extends through a residential community.

It is within the ambit of the present invention to cover any obvious modifications of the example of the preferred embodiment described herein

provided such modifications fall within the scope of the appended claims.

Claims

1. A structural pole comprising a pair of upright metal channel members (11; 11') having an elongated flat outer wall (17) with inwardly extending transverse structural flanges (18); said channel members being interconnected in substantially parallel relationship, with their flanges extending inwardly, by a series of inner braces (12) interconnected together and to said outer walls and spanning diagonally across said channel mebers and disposed in a predetermined pattern throughout the lengths of the channel members; each said diagonal brace being an elongated structural angle-iron bar having flat angulated connecting ends (22) having a through bore (23) therein and securable to said channel members by overlapping said connecting ends of adjacent diagonal braces, and a fastener (24) interconnecting each said overlapping connecting ends with said flat outer wall of said channels, characterised in that said structural flanges (18) of said pair of channel members (11, 11') have a right angle inner lip (19) extending inwardly and parallel to said flat outer wall and said elongated structural angle-iron bars (12) have right angle walls (20) of equal width, said inner braces (12', 12''') in at least a lower portion of said pole being interconnected diagonally across alternating sides of said channel members with an intermediate diagonal brace (12'') extending diagonally across opposed sides of the channel members and interconnected with the ends of the braces on alternating sides of said channel members and a lower one of said pairs of interconnected channel members being provided with an elongated structural rib (31) formed integral and disposed longitudinally in said flat outer wall.

2. A structural pole as claimed in Claim 1, characterised in that said inner braces (12) in a top portion of said pole are disposed along a common central plane (26) of said opposed channel members and interconnected therewith.

3. A structural pole as claimed in Claim 1 or 2, characterised in that each pair of said overlapping connecting ends are interconnected to said channel members.

4. A structural pole as claimed in Claim 1, characterised in that said channel members are steel members, two or more of said pairs of interconnected channel members being interconnected end-to-end by a telescopic connection joint at overlapped ends of said channel members.

5. A structural pole as claimed in Claim 1, characterised in that said angle walls (20) meet at an apex (21), said through bore (23) in said flat angulated connecting ends being centrally aligned with said apex.

6. A structural pole as claimed in Claim 1, characterised in that said structural interconnected channel members are secured in a concrete footing (14) formed in the ground.

Patentansprüche

1. Mastaufbau, mit zwei senkrechten U-förmigen Metallelementen (11; 11'), welche eine mit sich nach innen erstreckenden Querrändern (18) versehene längliche, flache Außenwand (17) aufweisen, wobei die U-förmigen Elemente durch eine Reihe von untereinander und mit den Außenwänden verbundenen inneren Verstrebungen (12) im wesentlichen parallel zueinander verbunden sind, wobei die inneren Verstrebungen (12) sich diagonal über die U-förmigen Elemente erstrecken und in einem vobestimmten Muster über deren gesamte Länge angeordnet sind und die Ränder der U-förmigen Elemente nach innen gerichtet sind, wobei jede diagonale Verstrebung eine längliche Winkeleisenstange mit flachen winkligen Verbindungsenden (22) ist, welche ein Durchgangsloch (23) bestizen und an den U-förmigen Elementen durch Überlappen der Verbindungsenden von nebeneinander angeordneten diagonalen Verstrebungen zu befestigen sind, und mit einem alle überlappenden Verbindungsenden mit der flachen Außenwand der U-förmigen Elemente verbindenden Befestigungselement (24),

dadurch gekennzeichnet, daß die Ränder (18) der beiden U-förmigen Elemente (11, 11') eine sich nach innen und parallel zu der flachen Außenwand erstreckende rechtwinklige innere Lippe (19) besitzen und die inneren Verstrebungen (12) rechtwinklige Wände (20) von gleicher Breite aufweisen, wobei innere Verstrebungen (12', 12''') in mindestens einem unteren Abschnitt des Mastes diagonal über die jeweils gegenüberliegenden Seiten der U-förmigen Elemente verbunden sind, wobei sich eine diagonale Zwischenstrebe (12'') diagonal über die gegenüberliegenden Seiten der U-förmigen Elemente erstreckt und mit den Enden der Verstrebungen an den gegenüberliegenden Seiten der U-förmigen Elementen verbunden ist und ein unteres der Paare von verbundenen U-förmigen Elementen mit einer länglichen Rippe (31) versehen ist, welche in der flachen Außenwand längs angeordnet und damit integriert ausgebildet ist.

2. Mastaufbau nach Anspruch 1, dadurch gekennzeichnet, daß die inneren Verstrebungen (12) in einem oberen Abschnitt des Mastes entlang einer gemeinsamen zentralen Ebene (26) der gegenüberliegenden U-förmigen Elemente angeordnet und damit verbunden sind.

3. Mastaufbau nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jedes Paar von sich überlappenden Verbindungsenden mit den U-förmigen Elementen verbunden ist.

4. Mastaufbau nach Anspruch 1, dadurch gekennzeichnet, daß die U-förmigen Elemente Stahlelemente sind, wobei zwei oder mehrere Paare der verbunden U-förmigen Elemente von Ende zu Ende durch ein Teleskopgelenk an sich überlappenden Enden der U-förmigen Elemente verbunden sind.

5. Mastaufbau nach Anspruch 1, dadurch gekennzeichnet, daß sich die in einem Winkel angeordneten Wände (20) in einem Scheitelpunkt

(21) treffen, wobei das Durchgangsloch (23) in den flachen winkligen Verbindungsenden in der Mitte mit dem Scheitelpunkt fluchten.

6. Mastaufbau nach Anspruch 1, dadurch gekennzeichnet, daß die untereinander verbundenen U-förmigen Elemente in einem in der Erde ausgebildeten Betonsockel (14) gehaltert sind.

Revendications

1. Pylône structural comprenant des éléments à peu près verticaux métalliques à profil en U (11; 11') qui représentent une paroi extérieure plate (17) de forme allongée, munie d'ailes structurales transversales (18) dirigées vers l'intérieur, lesdits éléments en U étant assemblés dans des positions relatives à peu près parallèles, avec leurs ailes dirigées vers l'intérieur, par une série d'entretoises intérieures (12) assemblées entre elles ainsi qu'auxdites parois extérieures et qui s'étendent en oblique de l'un à l'autre desdits éléments en U, et sont disposées selon un motif prédéterminé sur toute la longueur des éléments en U, chacune desdites entretoises obliques étant une barre structurale à profil de cornière allongée, qui possède des extrémités de liaison plates coudées (22) percées d'un trou traversant (23) et qui peuvent être fixées auxdits éléments en U par recouvrement desdites extrémités de liaison des entretoises obliques adjacentes, et un organe de fixation (24) qui assemble lesdites extrémités de liaison disposées en recouvrement à ladite paroi extérieure plate desdits éléments en U, caractérisé en ce que lesdites ailes structurales (18) de ladite paire d'éléments en U (11, 11') présentent une lèvre intérieure à angle droit (19) qui s'étend intérieurement et parallèlement à ladite paroi extérieure plate, et lesdites barres structurales à profil de cornière de forme allongée (12) possèdent des parois à angle droit (20) de même largeur, lesdites entretoises intérieures (12', 12''), au moins celles d'une partie inférieure du pylône étant assemblées en diagonale de l'un à l'autre des côté alternés desdits éléments en U, avec une entretoise diagonale intermédiaire (12'') s'étendant en diagonale de l'un à l'autre des côtés opposés des éléments en U, et est assemblée aux extrémités des entretoises sur les côtés alternés des éléments en U, une paire inférieure, parmi lesdites paires d'éléments en U assemblés, étant munie d'une nervure structurale de forme allongée (31) venue d'un seul tenant et disposée longitudinalement dans ladite paroi extérieure plate.

2. Pylône structural selon la revendication 1, caractérisé en ce que lesdites entretoises intérieures (12), dans une partie haute dudit pylône, sont disposées le long d'un plan central commun (26) desdits éléments en U opposés et sont assemblées avec ces éléments.

3. Pylône structural selon la revendication 1 ou 2, caractérisé en ce que chaque paire desdites extrémités de liaison en recouvrement sont assemblées auxdits éléments en U.

4. Pylône structurel selon la revendication 1, caractérisé en ce que lesdits éléments en U sont des éléments en acier, deux ou plus de deux desdites paires d'éléments en U assemblées entre eux étant assemblées bout à bout par un joint de liaison à emmanchement au niveau d'extrémités en recouvrement desdits éléments en U.

5. Pylône structurel selon la revendication 1, caractérisé en ce que lesdites parois à angle droit (20) se rejoignent à une sommet (21), ledit perçage traversant (23) percé à travers lesdites extrémités de liaison plates coudées étant aligné dans l'axe dudit sommet.

6. Pylône structurel selon la revendication 1, caractérisé en ce que lesdits éléments en U structuraux assemblés sont fixés dans une massif en bêton (14) formé dasn le sol.

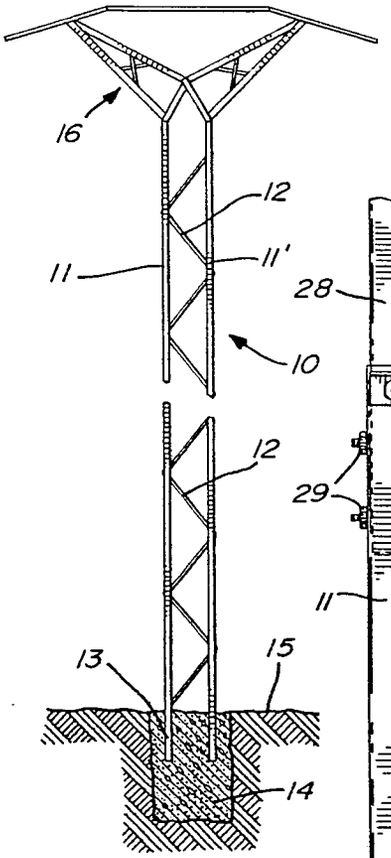

16
12
11
11'
10
12
13
15
14

Fig. 1

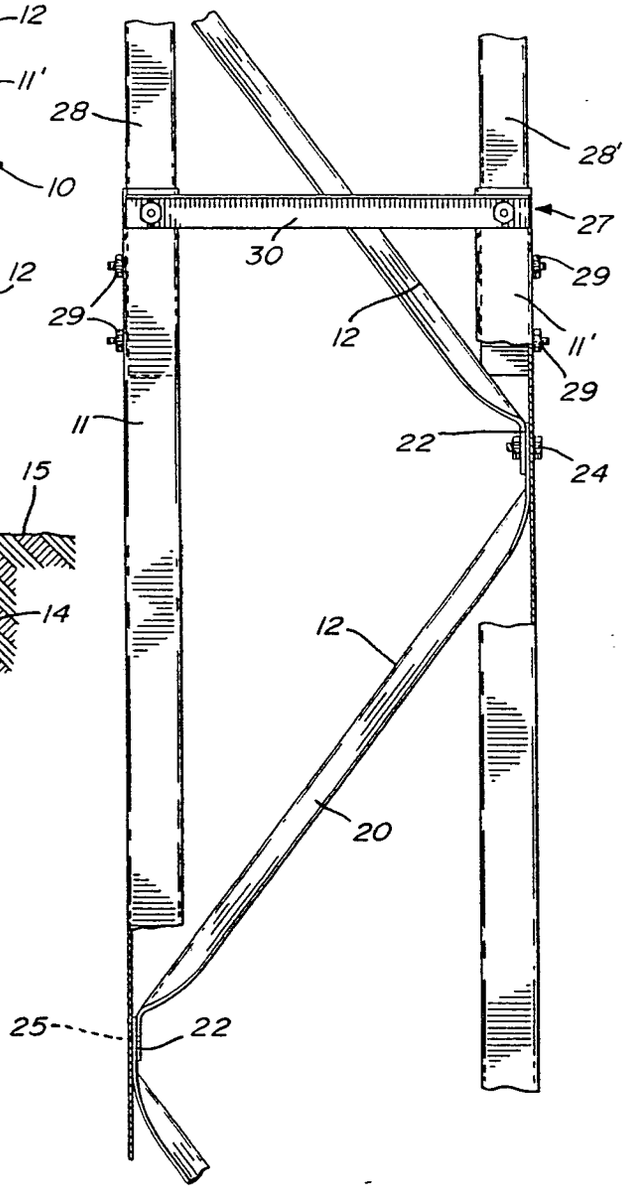
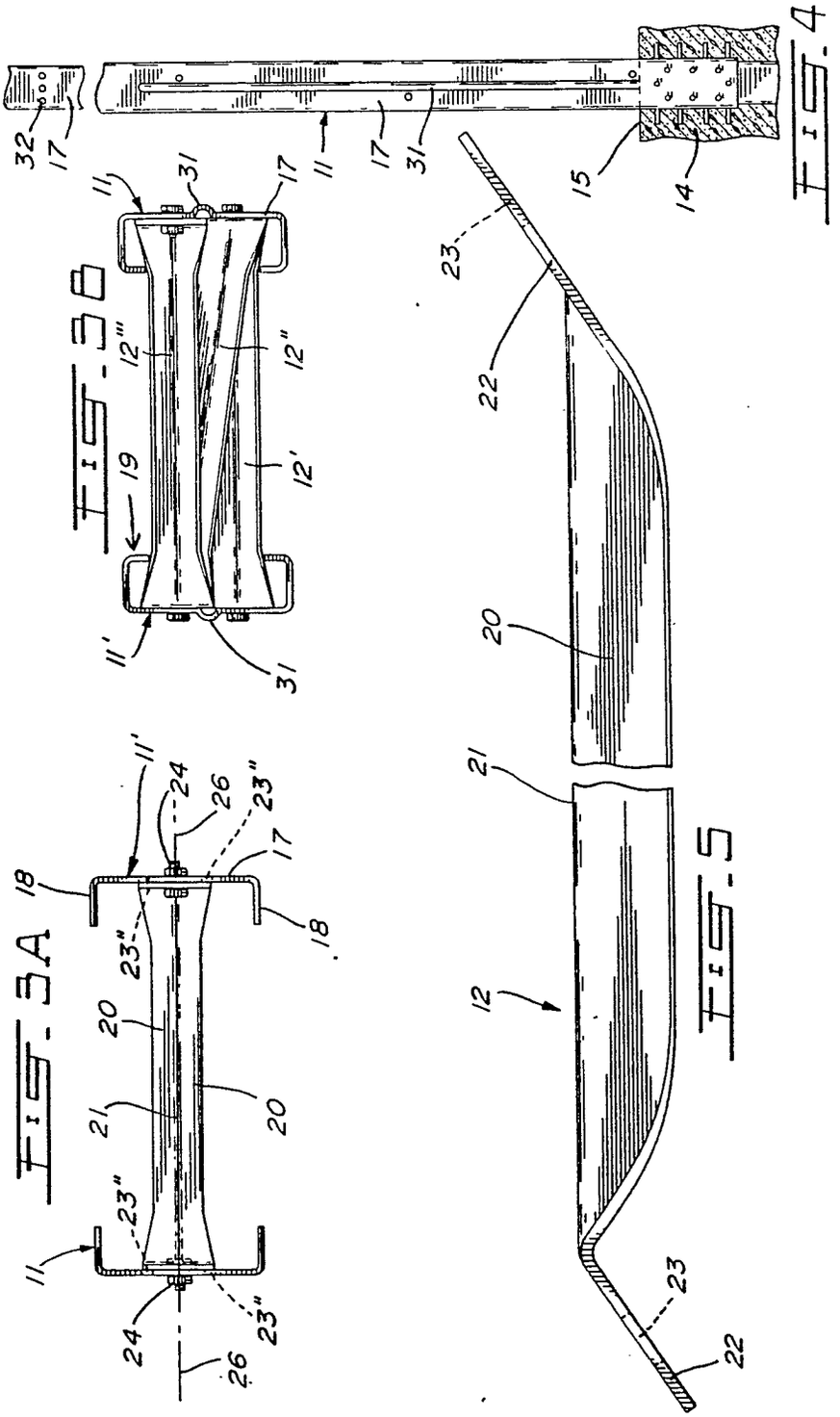

28
28'
27
30
29
29
12
11'
29
11
22
24
12
20
25
22

Fig. 2


32
17
11
17
31
15
14
FIG. 4
11
31
17
12'''
12''
12'
19
11'
31
FIG. 3B
11'
24
26
23''
17
18
18
23''
20
21
20
23''
11
24
23''
26
FIG. 3A
23
22
20
21
12
23
22
FIG. 5