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(54) METAL FRAMING SYSTEM

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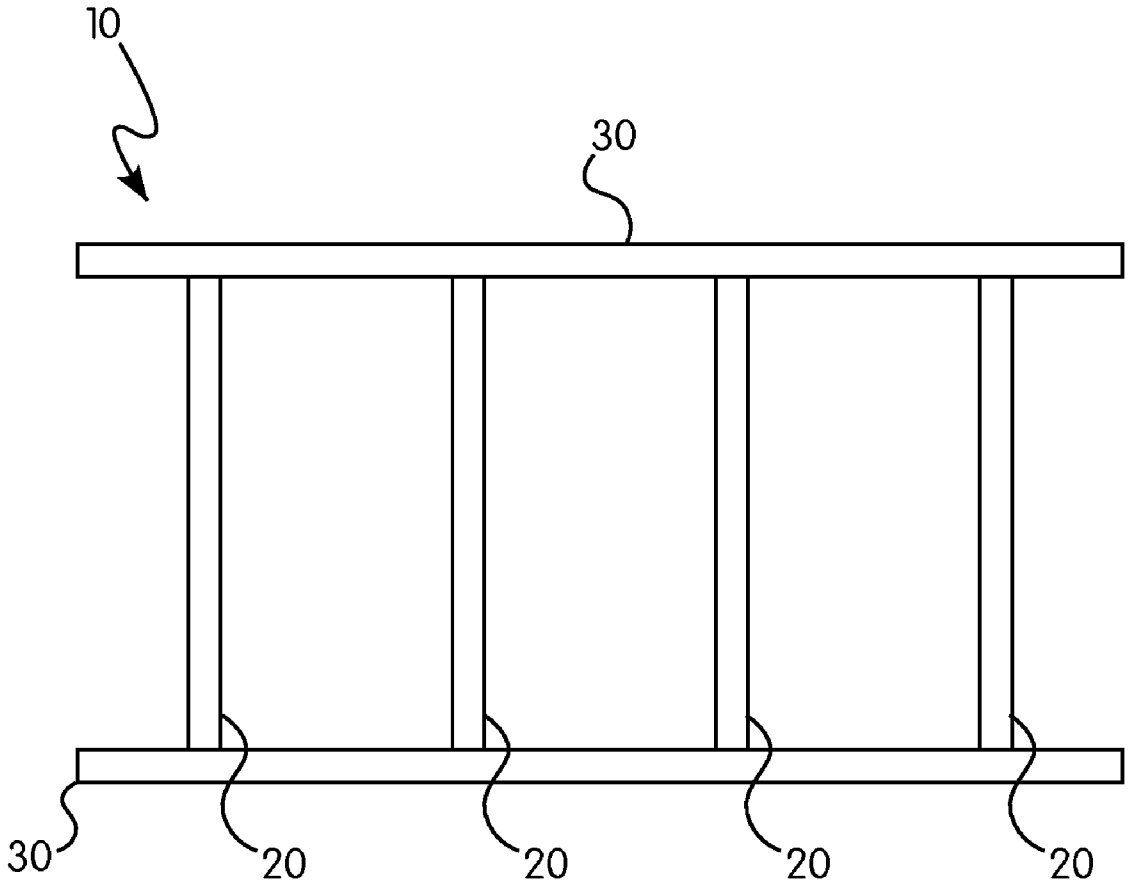
(57) **ABSTRACT**

The invention provides lightweight metal studs and tracks for use in wall framing systems produced by passing flexible thin steel between rolls, thereby forming a C-shaped member with defined longitudinal support ribs or projections on the stud members and transverse support ribs or projections on the track members that both increase the span strength, automatically spaces the vertical stud members and locks the stud members into place along the track member with a frictional fit.



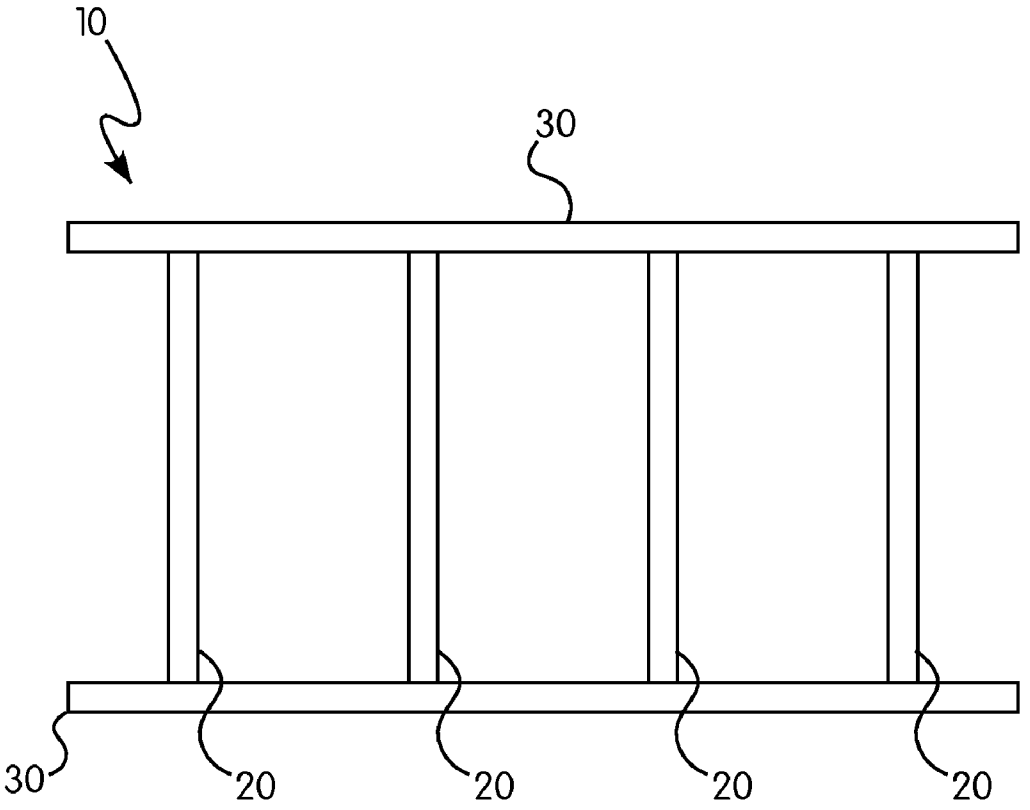


FIG. 1

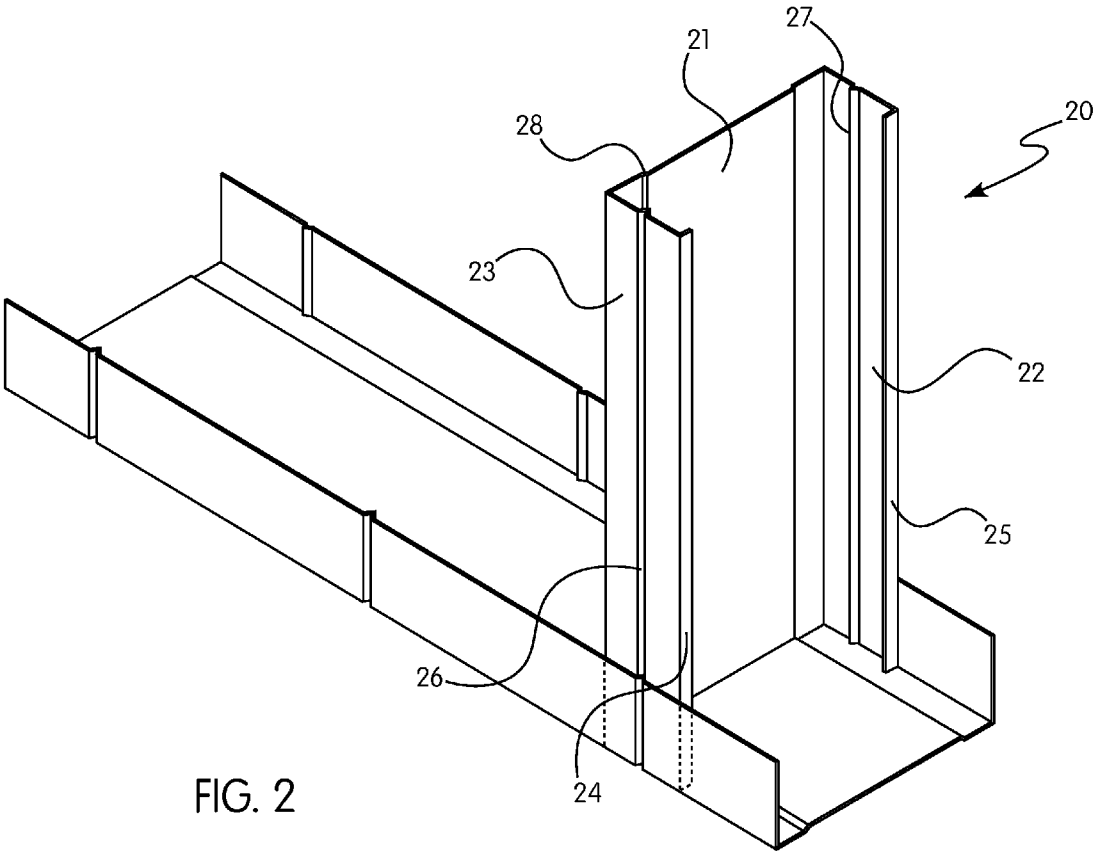


FIG. 2

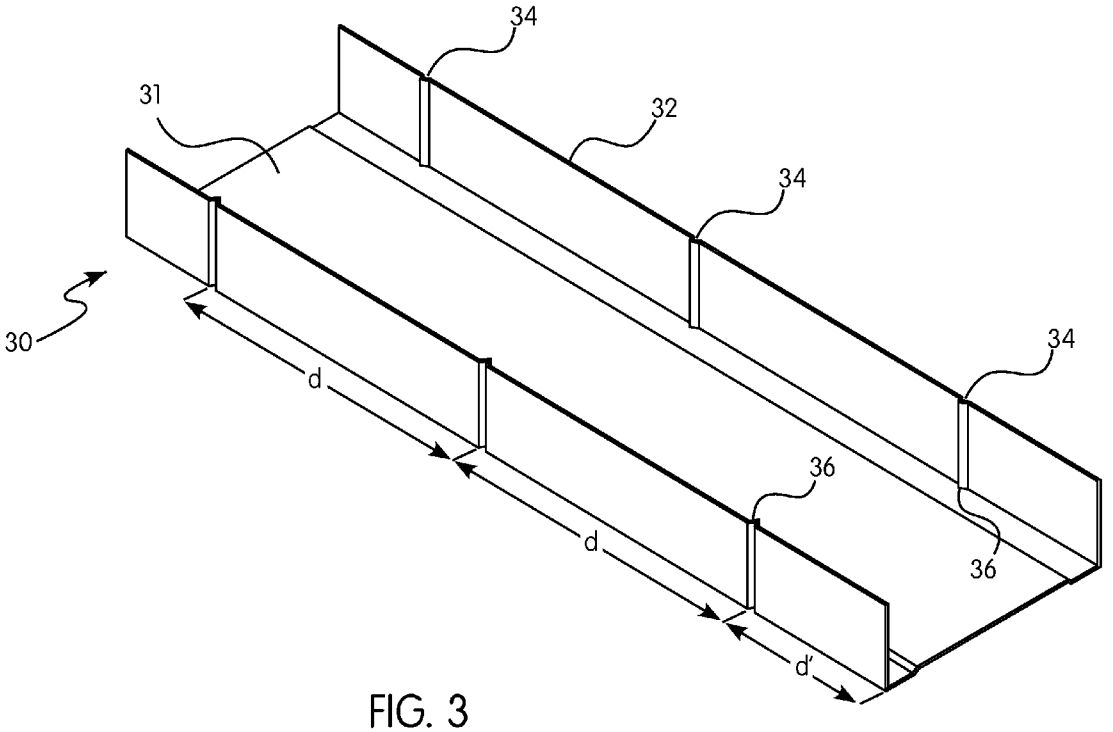


FIG. 3

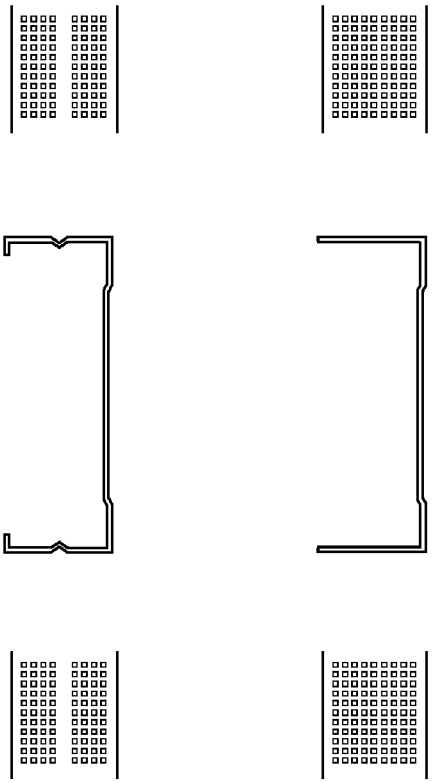


FIG. 4

FIG. 5

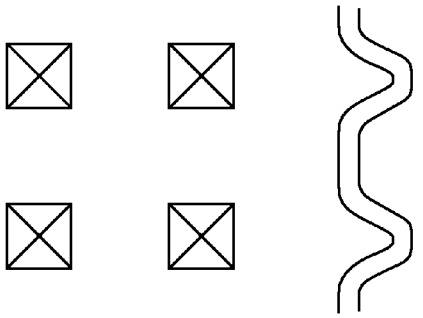


FIG. 6

METAL FRAMING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/990,822, filed on Nov. 28, 2007, entitled "Metal Framing System," the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The invention is related to the field of wall framing systems used in the construction of buildings for receiving sheets of gypsum drywall sheeting and, more particularly, to a system utilizing metal constriction for the studs and plates of the system.

BACKGROUND OF THE INVENTION

[0003] Metal framing systems have been used for some time in commercial construction and have recently become more popular in residential construction. Metal framing systems may include metal components used for studs and plates that are typically formed as three-sided channels, such as c-shaped channels. The systems typically utilize vertically extending metal channels as studs which are inserted into the open side of horizontally extending metal channels used for the sill and top plate members of the metal framing system. The joints between the vertical and horizontal members are usually secured with numerous fasteners such as screws. Metal straps may also be utilized to secure the vertically extending channel members to one another.

[0004] One problem with conventional metal framing members is their relative lack of stiffness in the lateral direction. Prior art metal studs, for example, are limited in their length and may be prone to twisting, especially with linger studs. Another problem is that the construction of walls utilizing metal components can be labor intensive, as the studs must first be measured for the correct spacing along the plates, then secured to the plates by screws or the like.

[0005] Therefore, it would be desirable to provide metal framing member having improved stiffness over greater lengths, without increasing the thickness of the metal of which they are formed. In addition, it would also be desirable to make the construction of the walls less labor-intensive.

SUMMARY OF THE INVENTION

[0006] The invention consists of a metal framing system that incorporates lightweight metal members produced by passing flexible thin steel between rolls, forming a c-shape consisting of a middle web and two parallel opposing side walls substantially perpendicular to the web.

[0007] The c-shaped members used as a studs define lateral support ribs or projections in the side walls that increase the strength of the member. Ribs may also be laterally defined in the web portion between the side walls. In the preferred embodiment, the lateral ribs are disposed substantially in the center of each opposing side walls, however, the ribs could also be offset. Preferably, the ribs are triangular in cross sectional shape, with the apex of the triangle facing the opposing side wall, however, the ribs may generally be of any cross sectional shape.

[0008] The ribs on the side walls of the stud members engage corresponding ribs on the track member to provide automatic spacing of the studs as well as a friction fit between the studs and plates.

[0009] In an alternate embodiment, one or both side walls of the stud members may also define a flange originating from the longitudinal edge of the side wall opposite the web and extending substantially in the direction of the opposite side wall.

[0010] The tracks of the framing system consists of members having the same basic construction as the stud members, however, the side walls of the track members define a series of spaced ribs therein which are disposed transverse to the side walls, such that when the track is laid horizontally, either as a sill or as a top plate, the transverse ribs are situated vertically. As such, the lateral ribs defined in the side walls of the stud members may engage the transverse ribs defined in the side walls of the track members to provide both an indexed spacing and a frictional fit. Preferably, the ribs transversely defined on one side walls will align with those define on the opposite side wall. As with the stud members, it is preferred that the ribs have a triangular cross section shape, with the apex of the triangle facing the opposing side wall, however any cross section shape could be used, as long as the cross sectional shape of the ribs in the plate members match those defined in the stud members.

[0011] The web and/or side walls of both the stud member and the track member may also have a pattern embossed thereon, such as by knurling, to increase the lateral strength of the members. In addition, the web of the stud members and track members may be provided with ribs or an offset construction, as will be explained later. These features of the web also increase strength and tend to resist twisting if the members.

BRIEF DESCRIPTION OF THE FIGURES

[0012] FIG. **1** shows a wall constructed with the metal framing system of the present invention.

[0013] FIG. **2** is a detailed perspective view of a portion of a framing stud member engaged with a portion of track member according to one embodiment of the present invention.

[0014] FIG. **3** is a detailed perspective view of a portion of the track member according to one embodiment of the present invention.

[0015] FIG. **4** shows top and side views of a stud member according to one embodiment of the present invention.

[0016] FIG. **5** shows top and side views of a track member according to one embodiment of the present invention.

[0017] FIG. **6** depicts one possible pattern of embossing of a stud or track of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] As shown in FIG. **1**, the invention presents, in one embodiment, a metal framing system **10** comprising at least one track **30** and at least one framing stud **20**. It will generally be desirable to form framing system **10** with substantially horizontal tracks **30** and substantially vertical studs **20**, as shown in FIG. **1**, however various angles may be employed depending on the particular construction project.

[0019] With reference to FIG. **2**, stud **20** comprises web **21** and two opposing side walls **22** and **23** integral with and extending substantially perpendicularly from web portion **21**, each of the opposing side walls **22** and **23** defining one or

more longitudinal ribs **26** and **27** respectively. Side walls **22** and **23** are preferably integral with web portion **21** and can be produced by the roll-forming process.

[0020] Longitudinal ribs **26** and **27** defined in side walls **22** and **23** are preferably triangular in cross sectional shape, having apex **29** oriented such as to face the opposing side wall, although one skilled in the art will recognize that ribs **26** and **27** may be formed of any desirable cross sectional shape. Ribs **26** and **27** are preferably located along the lateral centerline of side walls **22** and **23**, but in other embodiments may be offset from the lateral centerline as well. Preferably, longitudinal ribs **26** and **27** extend for the entire length of side walls **22** and **23**. In additional embodiments, multiple longitudinal ribs may be defined in each of side walls **22** and **23**.

[0021] In certain embodiments of the invention, stud **20** may also include one or more flanges **24** and **25** disposed on the ends of the side walls **22** and **23** along the longitudinal edge opposite web portion **21**. Flanges **24** and **25** are preferably disposed substantially parallel to web portion **21** but may be disposed at any desirable angle. Flanges **24** and **25** may additionally be any desirable width. Preferably, flanges **24** and **25** are approximately 0.125 inches to 0.250 inches in width; more preferably, 0.1875 inches in width. In alternative embodiments, flanges **24** and **25** may be replaced by a second web portion (not shown), which may be substantially parallel to the first web portion **21**.

[0022] Web portion **1** may define one or more offsets **28**, running longitudinally along the length of web portion **21**, to increase the strength of stud member **20** and to allow stud member **20** to resist twisting.

[0023] Track member **30** is shown in perspective view in FIG. **3**. Track **30** is of the same basic construction as stud **20** and includes web portion **31** having two opposing side walls **32** and **33** integral with and extending substantially perpendicularly from web portion **31**. Side walls **32** and **33** define one or more transverse ribs **34** in each of side walls **32** and **33**. Preferably, ribs **34** defined on side wall **31** will align with those defined on side wall **32**. Web portion **31** may define one or more offsets **38** to provide strength and to allow track member **30** to resist twisting.

[0024] Transverse ribs **34** are preferably triangular in cross section shape, with the apex of the triangle facing the opposing side wall, however, one skilled in the art will realize that transverse ribs **34** may be of any cross-sectional shape, and will also realize that the cross sectional shape of longitudinal ribs **26** and **27** defined in the side walls of stud **30** must be complimentary with the cross sectional shape of transverse ribs **34** defined in the side walls of track **30**.

[0025] It can be seen then, as shown in FIG. **2**, that studs **20** may be placed in track **30** such that longitudinal ribs **26** and **27** defined in the side walls of stud **20** frictionally engage with transverse ribs **34** defined in the side walls of track **30**, such that studs **20** are held in place and are positioned with the proper spacing. It should also be realized that a second track **30** will normally be used as a top plate in this framing system. Because of the frictional fit between studs **20** and tracks **30**, the framing system **10** of the present invention can be held in place without the use of mechanical fasteners. Tracks **30** may be of any convenient length.

[0026] The distance between transverse ribs d as shown in FIG. **3** hay be of any desirable length, but is preferably either 4, 8, 12 or 16 inches, providing spacing for studs **20** at distances d or at multiples of distances d. Typical residential and commercial construction, for example, places studs at 16 inch intervals. Having a transverse rib **34** formed at distance d' from the end of track **30** allows a stud **20** to be placed at the end of track **30**, and acts as a starting point for further spacing of transverse ribs **34**.

[0027] Creating transverse ribs **34** at desired distances (indicated in FIG. **3** by d and d') during the manufacturing process enables the user to automatically space apart the framing studs at that distance or multiples of that distance during framing system assembly, thus saving assembly time. In a preferred embodiment, the first and last ribs are placed between 1 and 3 inches, and more preferably 2 inches from the end of the track respectively. Preferably, the remaining ribs are spaced at 3 to 5, and preferably 4 inch intervals. Accordingly, in the preferred embodiment, studs **20**, when assembled into tracks **30**, will be located on 12", 16" or 24" centers. One of skill in the art will recognize that any desired distance d may be manufactured and multiple different distances may be employed on the same framing system.

[0028] Referring again to FIG. **3**, transverse ribs **34** are preferably oriented in side walls **32** and **33** such as to be normal to the direction of the web portion **31** and orthogonal to the lateral center line of side walls **32** and **33**. In alternate embodiments, however, transverse ribs **34** may be constructed at any angle. For example, track **30** may be designed to be installed on an inclined surface. In such a case, transverse ribs **34** may be constructed at an acute or obtuse angle such that transverse ribs **34** are substantially vertical when track **30** is placed on an inclined surface. In such cases, it may be necessary to manufacture or cut the bottom of stud **20** at an angle to match the deviation from normal of transverse rib **34**.

[0029] The invention also provides a method for making metal framing studs **20** comprising passing a length of sheet metal between a set of rolls to form a generally C-shaped stud member having a web portion **21** and two opposing side walls **22** and **23** integral with and extending from web **21**, each of the opposing sidewalls having one or more longitudinal ribs **26** and **27** running along the sidewalls. In a preferred embodiment of this method, passing the sheet metal between the set of rolls may additionally form one or more flanges **24** and **25** originating from the longitudinal edge of opposing side walls **22** or **23** opposite web portion **21** and extending substantially in the direction of the opposite second opposing sidewall **22** or **23**. Tracks **30** are manufactured in a similar manner, albeit without flanges.

[0030] The framing studs **20** and the tracks **30** are preferably made from a sheet metal. Preferably, the studs and tracks will be formed from a high-strength steel, but other suitable metals include, but are not limited to, aluminum, brass, steel, copper, cold rolled steel, mild steel, tin, nickel, or titanium, although any materials that may be formed in the manner disclosed may be used. Preferably, the framing studs **20** and the tracks **30** are formed from steel sheets having a thickness between about 30 gauge and about 8 gauge, more preferably about 20 gauge or 25 gauge. In one aspect of the invention, it has been found that 25 gauge track may be used with both 20 and 25 gauge studs. One of skill in the art will recognize that any combination of metals and gauges may be used so long as framing studs **20** frictionally fit in a complementary fashion with tracks **30**. Additionally, one of skill in the art will recognize that framing system **10** of the present invention may be employed in combination with prior art framing systems that may currently exist in certain expansion construction projects.

[0031] The framing studs **20** and tracks **30** may be manufactured to any desirable dimensions that may be required for a particular construction job. In preferred embodiments, the side walls are about 1 inch to 1.5 inches wide, and more preferably about 1.25 inches wide. In preferred embodiments, the web portions are about 1.5 inches to 8 inches wide; more preferably, the width of the web portions are about 1.625 inches, 2.5 inches, 3.625 inches, 4 inches, or 6 inches.

[0032] In certain embodiments, one or more of the sidewalls **22**, **23**, **32**, and **33** may be textured or embossed, such as by knurling or any similar patterning process. The embossing pattern on the stud and track tends to allow a drywall or sheet metal screw to be driven through the track and stud without the screw "walking" as it would tend to do on flat steel. FIG. **6** shows top and side views of the knurling pattern **100** of a sidewall of a track member and a stud member according to one embodiment of the invention. Preferably, the knurling pattern on the stud member is complementary to the knurling pattern on the track member to allow the stud member and track member to fit closely together, such that the transverse rib of the track member can engage with the longitudinal rib of the stud member without interference from the embossing pattern.

[0033] In a preferred embodiment, the framing studs **20** and the tracks **30** may be produced by roll-forming, that is, passing flexible thin metal between rolls to form a generally C-shaped channel. Roll forming machines are well-known and generally include a series of forming rolls arranged in successive forming stations along an advancing path. Suitable examples are disclosed in U.S. Pat. Nos. 4,045,989 and 6,604,397. In roll-forming, a piece of sheet metal is passed between top and bottom rolls of each successive forming station, wherein each forming station introduces an additional degree of bending to the metal until a desired cumulative bend in the metal is complete. Other processes commonly used for forming and shaping sheet metal may also be used including, but not limited to, stretching, drawing, deep drawing, cutting, bending and flanging, punching and shearing, spinning, press brake forming, roll forming and rolling.

[0034] Longitudinal ribs **26** and **27** in framing studs **20** and transverse ribs **34** in tracks **30** may be added by, for example, using an inline punching press. The formation of the ribs may be done in a pre-punch application (before roll-forming starts), in a mid-line punching application (in the middle of a roll-forming line/process), or a post punching application (after roll-forming is done). The roll-forming machines with inline punching capability are well known and are available, for example, from Johnson Bros. Metal Forming Co., Berkeley, Ill., USA.

[0035] Although the invention herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present invention. It is therefore to be understood that numerous modifications may be made to the illustrative embodiments and that other arrangements may be devised without departing from the spirit and scope of the present invention as defined by the following claims.

I claim:

1. A metal framing system comprising:

a. at least one track member having a c-shaped cross section, defining a web portion with opposing side walls extending from said web portion, having a plurality of transverse ribs defined in said opposing side walls of said tack member, said transverse ribs being spaced at pre-determined intervals along the length of said side walls; and

b. one or more stud members having a C-shape cross section, defining a web portion with opposing side walls extending from said web portion, having one or more longitudinal ribs defined in said opposing side walls of said stud member;

c. wherein said longitudinal ribs of said stud member engage with said transverse ribs of said track member when said stud member is inserted into said track member.

2. The framing system of claim **1** wherein said opposing side walls of said track members and said stud members form substantially 90-degree angles with their respective web portions.

3. The framing system of claim **2** wherein said stud members further comprise flanges defined on the lateral edge of said opposing side walls opposite said web portion, said flanges extending substantially toward the opposing side wall.

4. The framing system of claim **3** wherein said flanges are integral with said opposing sidewalls of said stud member and extend the complete distance between the opposing side walls of said stud member.

5. The framing system of claim **1** wherein said transverse ribs defined on one side wall of said track member are aligned with said transverse ribs defined on the opposing side wall of said track member.

6. The framing system of claim **1** wherein said longitudinal ribs are positioned substantially along the longitudinal centerline of said opposing side walls of said stud members.

7. The framing system of claim **1** wherein said longitudinal ribs defined on said opposing side walls of said stud members are aligned with each other.

8. The framing system of claim **1** wherein said longitudinal ribs form a friction fit with said transverse ribs when said stud member is engaged with said track member.

9. The framing system of claim **1** wherein each of said longitudinal ribs is engaged with a transverse rib.

10. The framing system of claim **1** wherein said track members and said stud members are composed of high-strength steel.

11. The framing system of claim **1** comprising:

a. a first track member;

b. a second track member disposed parallel to said first track member; and

c. a plurality of stud members having one end engaged with said first track member and an opposite end engaged with said second track member, said stud members being substantially perpendicular to said first and said second tack members.

12. The framing system of claim **1** wherein said opposing side walls of said track members and said opposing side walls of said stud members are embossed.

13. The framing system of claim **12** wherein said opposing side walls of said track members are embossed, and further wherein the embossing pattern on said track members is complementary to the embossing pattern on said stud members.

14. The framing system of claim **1** wherein said longitudinal ribs and said transverse ribs have complementary cross sectional shapes.

15. The framing system of claim **14** wherein said longitudinal ribs and said transverse ribs have triangular cross sectional shapes.

16. The framing system of claim **15** wherein said the apex of said triangular cross sectional shape of said longitudinal ribs and said transverse ribs face the opposing wall of said stud members and said track members respectively.

17. The framing system of claim **1** wherein said longitudinal ribs extend the entire length of said stud members.

18. A method for making metal framing studs comprising passing sheet metal between a set of rollers to form a generally c-shaped stud member having a web portion and two opposing side walls integral with and extending from said web portion, each of said opposing side walls having one or more ribs running longitudinally along the side walls.

19. The method of claim **18** wherein passing said sheet metal between said set of rollers additionally forms one or more flanges originating from the longitudinal edge of the opposing side walls opposite said web portion and extending substantially in the direction of the opposite side wall.

20. A method for making metal tracks for framing studs comprising passing sheet metal between a set of rollers to form a generally c-shaped stud member having a web portion and two opposing side walls integral with and extending from said web portion, each of said opposing side walls having one or more ribs running transversely across said side walls.

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