Dec. 28, 1937. W. T. DEAN 2,103,407

STEEL HOUSE CONSTRUCTION AND THE LIKE

Original Filed May 11, 1933 2 Sheets-Sheet 1

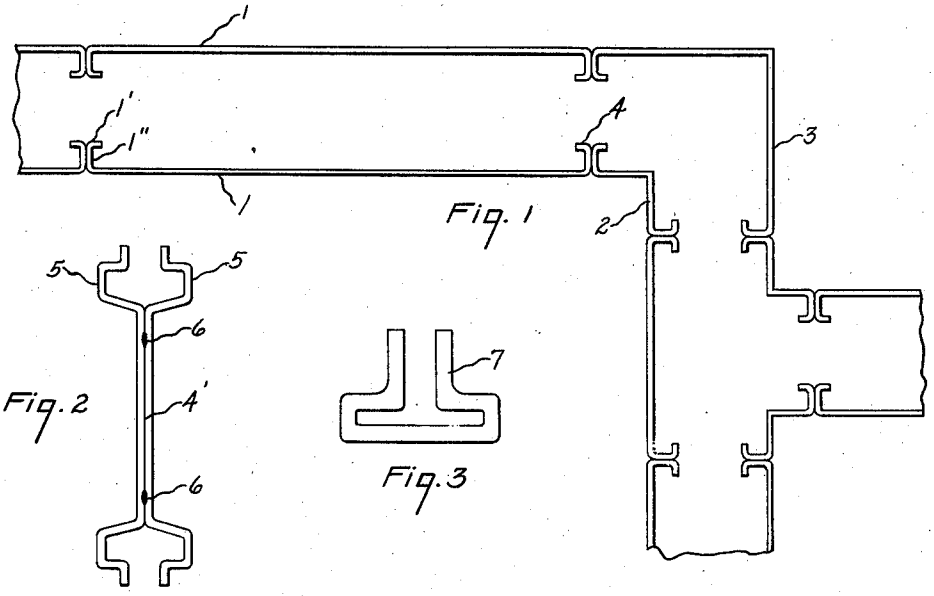

Fig. 1

Fig. 2

Fig. 3

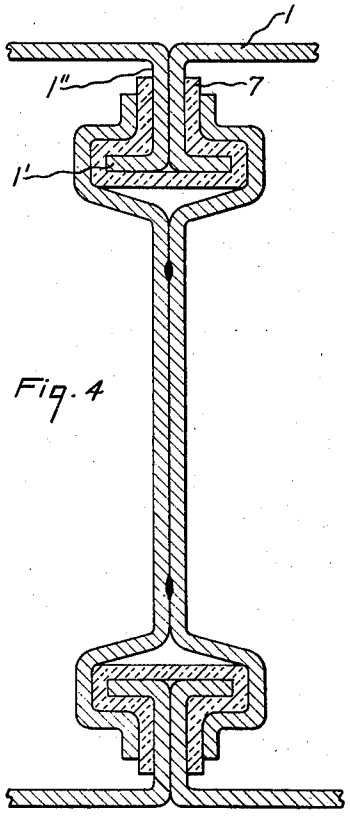

Fig. 4

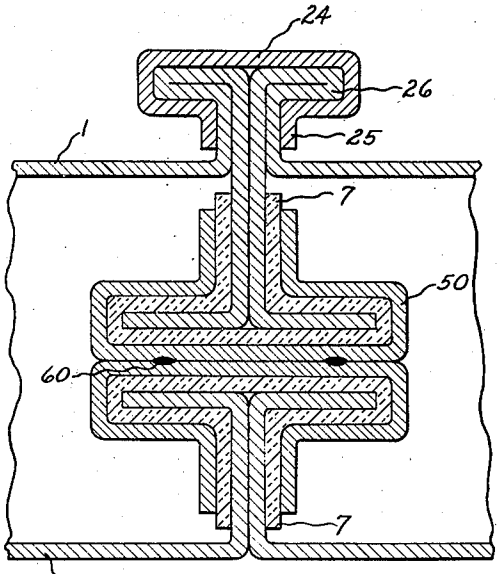

Fig. 5

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STEEL HOUSE CONSTRUCTION AND THE LIKE

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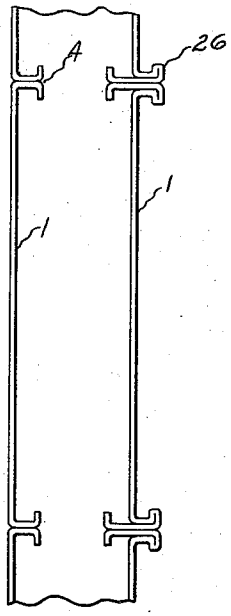

Fig. 6

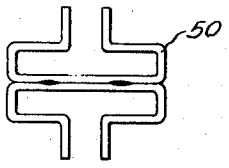

Fig. 7

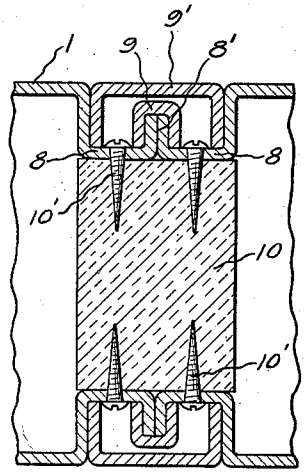

Fig. 8

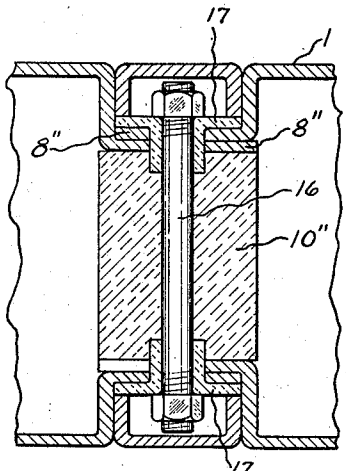

Fig. 9

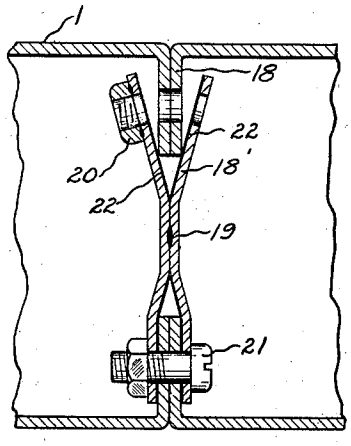

Fig. 10

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UNITED STATES PATENT OFFICE

2,103,407

STEEL HOUSE CONSTRUCTION AND THE LIKE

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Application May 11, 1933, Serial No. 670,444
Renewed May 5, 1937

7 Claims. (Cl. 189—34)

This invention relates to improvements in metallic building construction and more particularly to the formation of sheets of metal into panel units having locking and stiffening units from which wall sections may be assembled readily without the use of skilled labor.

Heretofore, metal structures have been built of both plain and corrugated metal sheets, such sheets being superimposed upon a framework or skeleton first erected for the purpose, saving, in one or two rare cases wherein sheets have been formed by convolutions into a framework or skeleton, which is then used to support inner and outer insulation and finished surfaces.

From a structural viewpoint no difficulty arises in erecting metal buildings of this general type, it being possible to secure any desired strength or architectural form. However, from a practical standpoint it is very expensive to erect buildings of this nature for the reason that it requires a great amount of skilled field labor together with bolts, rivets, field welding and elaborate finishing operations to conceal crude joints. Buildings of this general construction are undesirable also for the reason that they are seldom "livable" due to high heat conductivity of the metal and the rapidity with which heat flows from one surface to another through the many frame elements constituting "through metal" channels. Thus such structures as heretofore have been built are difficult to heat or keep cool regardless of the amount or nature of the insulation used to separate the inner and outer walls. Sound is also transmitted through the framework to the sheet wall surfaces which actually amplify the noise which should be absorbed in properly designed walls.

The heat insulating features of this invention are based on the principle that heat is reluctant to enter or leave a surface. For this reason the lock-bars which act as joiners for adjacent wall sheets and spacers between inner and outer wall sheets are designed and assembled in such a manner that a large number of surfaces are provided through which heat must pass before entering or leaving the building through its walls.

An object of this invention is to provide a building structure formed of metal sheets designed to permit a minimum amount of transfer of heat and sound.

Another object of this invention is to provide lock-bars for joining adjacent wall sheets and spacing inner and outer wall sheets, which are assembled to minimize heat transfer through the walls.

A further object of the invention is to provide a plurality of surfaces through which heat must pass in order to be transferred from one side of the wall to the other.

Another object of this invention is to provide a metal building construction which may be erected in the field without the use of skilled labor or extensive use of rivets, bolts and welding.

Still another object of this invention is to provide a house construction which may be readily erected in the field with a minimum of labor and which may be readily taken down and reassembled on another location.

Still another object of this invention is to provide a metal building construction having a decorative appearance which is pleasing to the eye.

These and other objects will appear from the following specification when taken with the accompanying drawings in which,

Fig. 1 is a plan view of a portion of a wall with only the panel elements in place,

Fig. 2 is a plan view of the lock-bar,

Fig. 3 is a plan view of the insulating sheath,

Fig. 4 is a horizontal section through a completed wall with the lock-bar and insulating sheath in place,

Fig. 5 is a vertical section of a roof or deck wall,

Fig. 6 is a plan view of a portion of a wall having panel elements of the structure shown in Fig. 5 with only the panel elements in place,

Fig. 7 is a plan view of the lock-bar used with the structure in Fig. 5,

Fig. 8 is a horizontal wall section of a modification of the invention,

Fig. 9 is a horizontal wall section of another modification, and

Fig. 10 is a horizontal wall section of still another modification.

In the drawings, 1 indicates the inner and outer wall panels. The edges of the wall panels and the inner and outer corner panels 2 and 3 are formed into integral locking members or return bends 4 comprising flanges 1' and webs 1''. When set up to form a wall as shown in Fig. 1 the return bends are positioned adjacent to each other. Two adjacent locking members or return bends 4 form an anchor to which the lock-bar 4' is fitted by telescopically sliding its restricted U channels shown in Fig. 2, over the anchor formed by the adjacent return bends 4. The inner and outer wall panels are thus locked rigidly together, respectively, and the inner and outer panels are rigidly held in fixed spaced relation to form with the lock-bars 4' a series

of closed box columns or girders possessing great strength with light weight.

The wall panels 1 may be of any desired material such as steel, alloy steel, copper, brass, aluminum or alloys and combinations of such metals. The panels may be given a decorative appearance by having a corrugated, perforated or design stamped surface. The decorative appearance may also be produced by cementing to the panel before bending a thin sheet of protective and decorative material. When this procedure is followed, the thin sheet is permanently locked to the panel 1 by the subsequent bending operation to form the return bends 4.

The lock-bar 4' is formed of two elongated strips substantially coextensive in length with the panels 1, spot welded at their center portions 6, and similarly bent at their sides to form facing channels 5. The facing channels on each side of the lock-bar 4' form the restricted U channels which telescopically engage the adjacent return bends 4. In order to insulate the wall panels from each other and from the lock-bars 4', the insulating sheaths 7 are provided. Each insulating sheath 7 is elongated to correspond to the lock-bar 4' and is telescopically fitted over adjacently disposed return bend portions 4 as shown by Fig. 4. They are formed of any suitable insulating material, fibrous or resinous, formed or extruded, but the use of thin metal forms dipped in insulation has been found most practical. The insulating material may be resinous, asphaltic or a rubber compound. For best results the insulating material should not soften seriously at 120 degrees Fahrenheit nor become brittle at sub-zero temperatures. The coating should be from $\frac{1}{32}$ to $\frac{1}{16}$ of an inch thick to provide additional compensation for such slight variations as may occur in forming the joining elements.

The depth of the return bends 4 is chosen to allow for expansion and contraction of walls with temperature changes, thereby avoiding bulging panels and permanently maintaining a smooth unbroken wall surface. It has been found that for the best design, considering all problems, that the flange 1', should be substantially equal to one-half the length of the web 1''. It is essential that each of the return bends 4, the panels 1, the lock-bars 4' and the sheaths 7 be alike respectively, and interchangeable. The forming operations for these parts may be accomplished on a good sheet metal brake or a press brake with suitable dies, but preferably on a rotary cold former.

With the wall panels above described any desired wall sections may be made. Fig. 1 illustrates straight wall sections, corners, partitions and intersecting walls. The individual panel sections 1, 2 and 3 and the lock-bars 4' are made at the factory in standard sizes in their final form or in long stock lengths from which dealers cut the final lengths. In order to erect a house or other building it is merely necessary to ship the required number of parts to the erecting point and under competent supervision have ordinary labor assemble the parts into the form desired. In the event that later it should become necessary to take down the building all of the parts may be salvaged and reerected into a new structure elsewhere, with no loss or destruction of materials.

With this improved construction the structure is, when initially erected, complete without the necessity of plastering, painting and other finishing operations, for the reason that the construction of the panel members adapts itself to permit final decorative or ornamental design before the panel members ever leave the factory. It is to be understood that any suitable caps may be used to enclose open ends and any suitable means may be used to join floor and roof sections to wall sections, etc.

The walls when completely assembled may be left hollow or filled with an insulating material. In either case there is no metal to metal contact between the inner and outer wall panels. The lock-bars which connect the inner and outer walls are insulated from these walls by the sheaths 7. In addition to the insulating action of the sheaths 7, heat is insulated by the action of the plurality of surfaces through which heat must pass to be transferred from one side of the wall to the other. Even though there be direct contact between any two bodies, the passage of heat through both of them is less rapid than the passsage of heat through a single body of equal size to the two contacting bodies.

Fig. 5 illustrates a modified form of lock-bar 50 and a wall construction particularly adaptable to roof and deck installations where there is likely to be standing water. It is also adaptable for exterior walls where a veneer of brick, stone or the like is to be used or where it is desired to attach laths for stucco. This construction also may be used for interior wall constructions where it is desired to attach wall board or laths for plaster. The inner wall panel 1 is the same as in the construction shown in Fig. 1. The outer wall panel 1 is constructed with a modified form of return bend 26. The return bend 26 is integral with the outer panel 1 and may be termed an outer return bend as it has an external web and flange corresponding to the internal web 1'' and flange 1' shown in Fig. 1. In fabrication it is formed in advance of the usual internal return bend 4. Adjacent external return bends 26 are locked together by battens 24 which are elongated and are telescopically fitted to the external return bends similarly to the fitting of the lock-bars 4' to the internal return bends 4. The batten 24 may be made with a skirt 25 or not, as desired.

The modified lock-bar 50 is similar in design to the lock-bar 4' and its function is the same. This form of lock-bar is particularly adaptable to constructions requiring walls of small thickness. The two restricted U portions are welded together at 60. The sheath 7 is the same as the sheath 7 used in Fig. 4. Fig. 6 illustrates a wall section according to the modification of Fig. 5 but with the sheaths 7, the battens 24 and the lock-bars 50 removed. Fig. 7 is a separate view of the lock-bar 50. The ceiling and deck constructions shown in Figures 5 and 6 may have their upper panels perforated for admitting concrete or light insulating concrete if it is desired to keep down the weight and increase the heat and sound insulating properties.

Figs. 8, 9 and 10 disclose modified forms of lock-bars. The wall panels 1 are formed with integral locking members or bends equivalent to the return bends 4. These locking members are made by any suitable forming operation and preferably in the same manner as the return bends 4. Referring particularly to Fig. 8 the integral locking members comprise parallel offset flanges 8 and return webs 8'. When two wall panels are adjacently disposed the corresponding return webs 8' are side by side as shown in the

drawings. The adjacent panels are locked together by external lock-bars 9, which are U-shaped and fitted over the adjacent return webs 8'. The external lock-bars 9 are concealed from view and the surface of the wall made smooth by flush battens 9'. The inner and outer panels are insulated from each other and held relatively to each other by the insulating studs 10, which may be of wood, fibre, asbestos, cement composition or other suitable material. Screws 10' through the parallel offset flanges are provided to attach the panels to the studs.

In Fig. 9 the structure is somewhat similar to that in Fig. 8 with the exception that the return webs 8' are dispensed with and the parallel offset flanges 8'' overlap. The inner and outer walls, respectively, are locked together by a bolt 16 passing through the overlapping parallel offset flanges. The bolt 16 at the same time passes through a stud 10'' similar to stud 10 and holds the inner and outer panels fixed with respect to each other. Through metal from one side of the wall to the other is avoided by means of the insulating washer 17 made of fibre or any suitable material. Instead of using a through bolt the stud 10'' may be solid and bolt replaced by a screw on each side.

In the form disclosed by Fig. 10, the locking members 18 are formed by single right angle bends of the panel sides. The lock-bars are comprised of two flat strips 18' of sheet metal connected together at 19 as by spot welding and are sprung apart for telescoping over the locking members. The locking members 18 and the lock-bars 18' are pre-punched and flat nuts 20 fixed as by welding to one pair of the panel elements. The lock-bars 18' are coated with a plastic, or the like, insulator 22, between the strips. After telescoping the lock-bars 18' in place they are firmly clamped on the locking members 18 by the bolts 21. The bolts 21 preferably are enameled to prevent actual metal contact with the locking members 18.

While the foregoing specification taken with the drawings describes specific embodiments, they are merely illustrative of the invention. Thus it is within the scope of this invention to use the lock-bar of Fig. 2 with the wall sections of Fig. 5 or a wall section may be constructed having exterior return bends on both inner and outer panels. It is further within the contemplation of this invention that the structure be made up in miniature form for use as toys, and it is intended that I be limited only by the scope of the following claims.

I claim:

1. In a building construction of the type described, a wall comprising a plurality of inner and outer panels having side edges respectively, the inner and outer panels being disposed adjacent to each other and the outer panels being spaced from the inner panels, integral return bend portions formed on the side edges of each of said panels extending inwardly, the integral return bend portions formed on the side edges of the outer panels first extending outwardly beyond the outer surface of the wall, said inwardly extending return bend portions of said panel being adjacent to each other, and elongated lock-bars associated with said inner and outer panels, each of said lock-bars comprising strips telescopically engaging said inwardly extending return bend portions, to lock together, to form rigid self-sustained connections preventing lateral movement of said panels in any direction, adjacent inner and outer panels, and to hold the same inner and outer panels in fixed spaced relation.

2. In a building construction of the type described, the combination of two adjacent inner panels and two adjacent outer panels each spaced from each other, integral return bend portions on adjacent sides of said panels, a lock-bar comprising a spacing portion, and a restricted U-channel at each side thereof, said restricted U-channel telescopically engaging said adjacent return bend portions positively to lock them together to form rigid self-sustained connections preventing lateral movement of said panels in any direction and holding in spaced relation said inner and outer panels, at least one of said restricted U channels including a lining of insulating material for restraining the flow of heat from one of said panels to the other.

3. In a building construction of the type described, a wall comprising a plurality of inner and outer wall panels, the respective inner and outer panels being disposed adjacent to each other, return bend portions at the side edges of each panel, and lock-bars associated with said inner and outer panels, each of said lock-bars telescopically engaging adjacent and opposed pairs of return bend portions to lock rigidly together to form rigid self-sustained connections preventing lateral movement of said panels in any direction, adjacent and opposed pairs of said panels and to hold in fixed relation the inner and outer wall panels, at least one of said lock-bars including at at least one side thereof a lining of insulating material for restraining the flow of heat between said inner and outer panels.

4. In a building construction of the type described, a wall comprising a plurality of inner and outer panels having side edges, the respective inner and outer panels being disposed adjacent to each other and the outer panels being spaced from the inner panels, integral inner return bends formed on the side edges of said panels and integral outer return bends formed on the side edges of said outer panels, said respective return bends of adjacent panels being adjacent to each other, means positively to lock together said outer return bends to form rigid self-sustained connections preventing lateral movement of said panels in any direction and means positively to lock together said inner return bends to form rigid self-sustained connections preventing lateral movement of said panels in any direction, said last named means comprising elongated strips having oppositely facing restricted U's adapted to telescopically engage said inner return bends.

5. In a building construction of the type described, the combination of inner and outer sheet metal wall panels having side edges, the respective inner and outer panels being disposed adjacent each other and the outer panels being spaced from the inner panels, integral return bend portions formed on the side edges of said panels, said return bend portions of adjacent panels being adjacent each other, and elongated panel locking lock-bars, each telescopically engaging adjacent and opposed pairs of return bend portions and positively locking together to form rigid self-sustained connections inherently preventing lateral movement of said panels in any direction, adjacent and opposed pairs of said respective inner and outer wall panels, and holding in spaced relation the inner and outer wall

panels, at least one of said lock-bars including a lining of insulating material to restrict the flow of heat from the inner wall panels to the outer wall panels, said insulating means cooperating with said locking means in the locking of the respective panels, and being characterized by the fact that it is sufficiently yieldable to permit commercial variations in the relative sizes of the lock-bars and panels and to provide a tight connection between the lock-bars and their respective panels.

6. In a building construction of the type described, the combination of a plurality of inner and outer sheet metal panels having side edges, the respective inner and outer panels being disposed adjacent each other and the outer panels being spaced from the inner panels, integral return bend portions formed on the side edges of each of the said panels, said return bend portions of adjacent panels being adjacent to each other, and sheet metal studs each telescopically engaging adjacent and opposed pairs of return bend portions, connecting adjacent and opposed pairs of inner and outer panels, and spacing the inner panels from the outer panels, at least one side of said sheet metal studs having a lining of insulating material to restrain the flow of heat between said inner panels and outer panels, said insulating material comprising an extruded sheet.

7. In a building construction of the type described, the combination of a plurality of inner and outer sheet metal panels having side edges, the respective inner and outer panels being disposed adjacent each other and the outer panels being spaced from the inner panels, integral return bend portions formed on the side edges of each of the said panels, said return bend portions of adjacent panels being adjacent to each other, and sheet metal studs, each telescopically engaging adjacent and opposed pairs of return bend portions, connecting adjacent and opposed pairs of inner and outer panels, and spacing the inner panels from the outer panels, at least one side of said studs having a lining of insulating material for insulating the inner panels from the outer panels.

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