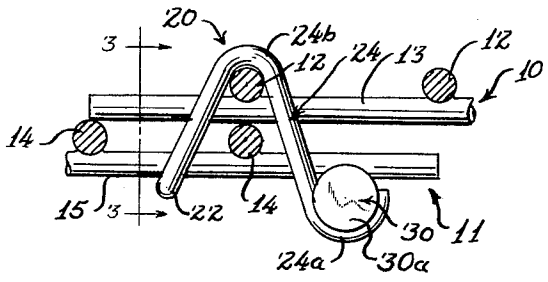
Nov. 30, 1965 W. S. DEMING 3,220,518

PANEL ASSEMBLY AND FASTENER

Filed April 25, 1962

Fig 2



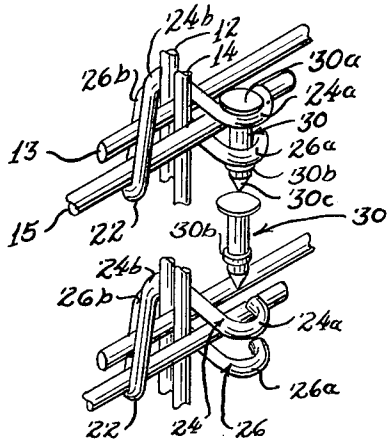


Fig 5

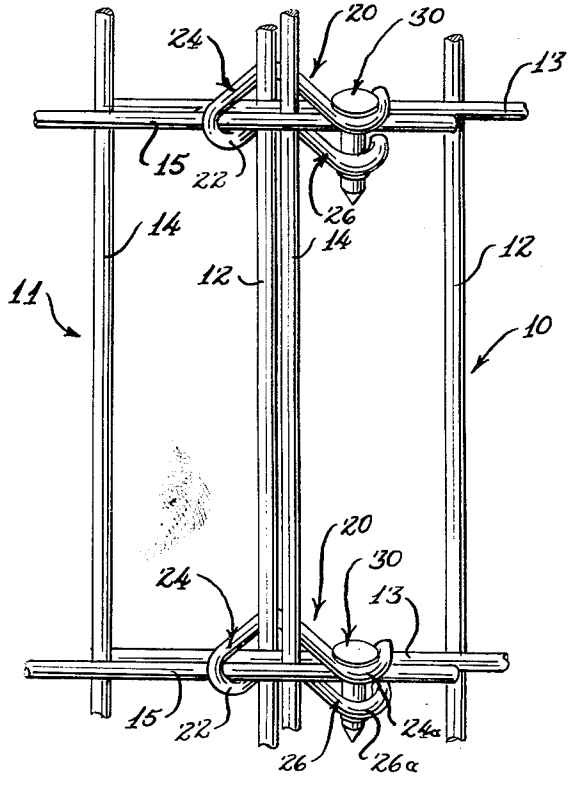
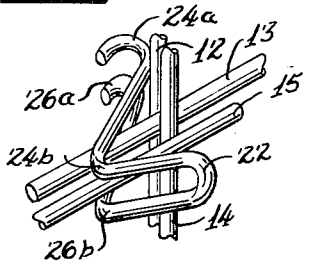


Fig 1

Fig 4



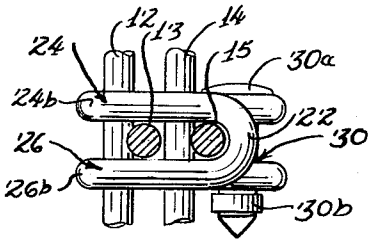


Fig 3

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PANEL ASSEMBLY AND FASTENER

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5 Claims. (Cl. 189—36)

This invention relates to a panel assembly and to an improved fastener or clip for uniting wire or bar mesh panels. The joined panels may be used in the construction of such items as corn cribs, wire mesh fencing, reinforcing mesh, hog pens, farrowing pens, and so forth.

In constructing a unit such as a corn crib of a plurality of wire or bar mesh panels, it is necessary that the panels be firmly interconnected so that the structure will be strong and able to withstand all of the forces which it may be expected to encounter. Speed and ease of erection are also highly desirable characteristics for such a unit, and since it is oftimes desirable to relocate such a unit facility of disassembly is considered to be an important factor.

One means for accomplishing the connection between panels has been to form at the edges of the panels, loops or hooks which may be aligned with similar loops or hooks on adjacent panels. The panel loops may then be locked in this relatively aligned position by means of a rod driven therethrough. From the fabricator's standpoint this type connection necessitates a separate and special wire forming operation which adds to the cost of the unit. Moreover, in order to strengthen this connection, some fabricators have resorted to the welding of the loops while others have provided the special clips which serve to prevent the loops from opening under tension. Additionally, since several sets of loops are sometimes traversed by a single lock rod, difficulty may be encountered in aligning some of the loops so that the rod may be inserted.

It is, therefore, one object of this invention to provide an improved reticulated metal panel assembly.

It is another object of this invention to provide a fastener which may be used to firmly join reticulated metal panels in overlapping relationship.

It is a further object of this invention to provide an exceptionally strong fastener which may be quickly and easily applied to unite adjacent wire or bar mesh panels and which may be easily removed to facilitate disassembly of the panels.

It is an additional object of this invention to provide a fastener which will lock two reticulated metal panels together without requiring the panels to have end loops and without necessitating the use of special tools to effect alignment of portions of the panels during assembly.

It is a still further object of this invention to provide a joint between adjacent wire or bar mesh panels which is as strong as the panels themselves.

It is an additional object of this invention to provide a very strong fastener which can be quickly and inexpensively manufactured and which may be quickly and easily applied to the panels to effect the joining thereof.

It is still another object of this invention to provide a reticulated metal panel structure employing a novel fastener which materially reduces the cost of the structure and greatly facilitates the erection thereof.

Other objects will be seen, and a further understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawing.

The improved fastener constructed in accordance with this invention is for use in combination with a pair of reticulated metal (i.e., wire or bar mesh) panels. Each panel comprises two transversely disposed sets of parallel wire or barlike elements. One set of elements extends

horizontally, and the other, vertically; and one of the sets of elements is superposed on the other set, and the sets are joined usually by welding. In order to effect the uniting of two adjacent panels, the panels are disposed in partial overlapping registration and are similarly oriented, so that their corresponding aligned "superposed" elements of the panels are spaced apart by the transversely disposed "other" element or elements of the overlapping panel. This orientation also places the vertical element of one of the panels in contiguous relationship with the horizontal element of the other panel. In the illustrated embodiment the horizontal elements are considered the superposed elements. The panels are normally subjected to forces tending to separate the panels in a direction parallel to the extent of the superposed elements.

The fastener used to unite these partially overlapped panels comprises a member formed of a single bar and bent approximately at its midpoint to form a bight with a pair of similarly shaped substantially coextensive legs extending therefrom. Thus, the member is closed at the one end and open at the other. The legs have aligned hook portions adjacent the open end, and intermediate the bight and the hook portions are laterally extending aligned knee portions. The fastener is positioned with respect to the partially overlapped panels such that a superposed element of one of the overlapping one of the panels at the lap is disposed within the closed end or bight of the member, and the knee portions of the legs extend about an adjacent element of the other of said sets of elements of the other of said panels at the lap. The hook portions of the legs are disposed outwardly of the superposed panel element of said overlapping panel, and a pin is disposed within and traverses these hook portions in order to lock the member in position.

In this manner, a very strong joint may be quickly formed between adjacent panels without the necessity of wire loops in the panels and without additional clamping, welding or reinforcing.

With reference to the drawing:

FIGURE 1 is a perspective view of portions of two panels showing the relationship between the panel elements and showing the fastener employed to join these panels in accordance with this invention;

FIG. 2 is a top plan view of the panel portions illustrated in FIG. 1;

FIG. 3 is a sectional elevation view of the panels taken substantially along line 3—3 of FIG. 2;

FIG. 4 is a perspective view showing the manner in which a fastener may be applied to the overlapping panels; and

FIG. 5 is a perspective view showing two adjacent fasteners, one of which has the pin inserted within the aligned hook portions of the legs and the other of which has the pin in position for insertion.

With further reference to the drawing, and particularly to FIG. 1, there are shown portions of two panels **10** and **11** formed of a heavy wire or rod arranged in a grid pattern. Panel **10** consists of a plurality of parallel elements **12** which are illustrated as extending in the vertical direction and a plurality of parallel elements **13** which traverse the vertical panel elements **12** on one side thereof and are illustrated as extending in the horizontal direction. Panel **11** is identically constructed consisting of a set of vertical elements **14** and a set of horizontal elements **15** disposed to one side of the vertical elements. In each panel the horizontal and vertical elements are welded together to form a strong rigid panel structure. In the process of welding the horizontal and vertical panel elements, it is preferred that the elements be impressed into each other, as illustrated in FIGS. 2 and 3. This provides a very strong and laterally stable panel structure and is

utilized to best advantage in this invention, as will be hereinafter more fully described. The thickness of each panel is thus preferably slightly less than the sum of the diameters of one vertical element and one horizontal element.

The vertical panel elements **12** and **14** may, for example, be spaced apart approximately 2 inches, respectively, whereas the horizontal panel elements **13** and **15** may be spaced about 6 inches apart, respectively. The ends of the horizontal panel elements **13** and **15** overextend the end vertical elements **12** and **14**, so that once the panels are joined by the fasteners **20**, as will be described, the panels cannot be pulled apart sufficiently to effect disengagement of these panel element ends from either the panel elements **14** or the ends of the fasteners **20**. The gauge of the wire or rod from which the panels **10** and **11** are constructed will vary according to the application. For example, it is preferred that #4 to #5 gauge wire be used for corn crib structures, although in some instances it may be desired to use heavier or lighter gauge. For the purpose of this description the terms "wire" and "rod" are considered equivalents and may be used interchangeably.

It is to be noted from FIGS. 1 and 2 that the panels are arranged in slightly overlapping relationship, and they are similarly oriented, that is, the vertical elements **12** and **14** are disposed on the same side of their respective horizontal elements **13** and **15**. The horizontal elements **13**, which in this instance are the "superposed" elements, of panel **10** are in registration with the horizontal elements **15**, which in this instance are the "superposed" elements, of the panel **11** (see FIGS. 1 and 3), and the end vertical or "other" elements of the panels are also in registration (see FIG. 2). The fastener **20** is adapted to join these two thus oriented and partially overlapped and registered panels.

The fastener **20** comprises an integral rodlike member which may be of the same gauge as the panel elements **12–15**. Actually because of the novel design, the fastener member may be of somewhat lighter gauge than the panel elements. The member is bent at approximately its mid portion to form a bight **22** and a pair of integral, substantially coextensive, similarly shaped legs **24** and **26**, the spacing between the legs being uniform and slightly greater than the diameter of the panel elements. The bight **22** effectively closes one end of the fastener member, whereas the other end of the fastener member is open. Adjacent the open end of the member each of the legs **24** and **26** is provided with a hook portion **24***a* and **26***a*, respectively, and these hook portions are aligned. Intermediate the closed end and the hook portions **24***a* and **26***a*, the legs extend laterally and are bent through an acute angle of greater than about 35 degrees and preferably between about 40 and about 50 degrees to form knee portions **24***b* and **26***b*, respectively, which are also aligned.

The radius of the bend at the bight **22** and at the knee portions **24***b* and **26***b* is preferably equal to or slightly greater than the radius of the panel elements **12–15**. The lateral extension of the knees **24***b* and **26***b* is sufficient to permit the knees to extend about the vertical panel element **12** of panel **10** when the horizontal panel element **15** is disposed within the closed end or bight **22** (see FIG. 2). The effective lateral extension or offset of the knees with respect to the bight may be measured along a plane which would bisect the knees **24***b* and **26***b*, and it is the distance between the interior of the knees and a plane which would be perpendicular to the knee-bisecting plane and would pass through the interior of the bight **22**. It will be noted from FIGS. 2 and 3 that this effective lateral extension of the knees with respect to the bight is slightly greater than the distance between that plane defined by the outermost parts of elements **12** and that plane defined by the outermost parts of panel elements **15**. This distance may also be defined as the sum of the thicknesses of the two panels. In order to provide a tight engagement of the panel elements by the fastener, the effective lateral extension of the knees should be approximately equal to (or slightly greater than) the thickness of the lap.

Also, the distance between the closed end or bight **22** and the portion of legs connecting the knees and hook portions is slightly greater than the sum of the thicknesses of the two panels. This feature permits the fastener to be easily swung about the panel elements as illustrated in FIG. 4 until positioned as shown in FIG. 5. It will be noted that the distance between the knees **24***b–26b* and the hook portions **24***a–26a* is greater than the distance between the knees and the bight **22**, and thus when the fastener member is fully positioned about the panel elements, as illustrated in FIG. 4, the hook portions will extend outwardly from the plane defined by the outermost parts of the panel elements **15**.

In order to lock the member in its position in engagement with the panel elements, a pin **30** is provided. This pin preferably has an enlarged head portion **30***a* and a protruberant portion **30***b* spaced from the head **30***a* a distance which is slightly greater than the distance through the hook portions **24***a* and **26***a*. The tip of the pin may be tapered to facilitate initial insertion of the pin through the hook portions **24***a* and **26***a*.

The effective relative lateral offset distance between the knees **24***b–26b* and the hook portions **24***a–26a* as measured along a line which would bisect the knees is the distance between the interior of the knees and a plane which would be perpendicular to the knee-bisecting plane and would pass through the interior of the hook portions. This distance is slightly greater than the sum of the thicknesses of the two panels **10** and **11** and the diameter of the pin **30**. As a result of this, when the pin **30** is inserted through the hook portions **24***a–26a*, this pin will be held against the horizontal element **15**, and the protuberance **30***b* will prevent the pin from being accidentally removed.

In FIG. 5 there is illustrated a pair of vertically adjacent fasteners. In the top fastener the pin **30** has already been inserted through the hook portions **24***a* and **26***a*, whereas in the bottom fastener the pin is in position for insertion through these hook portions. After a pin has been inserted it is resiliently held in place by the head **30***a* at the top and by the protuberant formation **30***b* at the bottom. Because of the orientation of the panels **12** and **14** and the structure of the fastener, the action of the fastener on the panels is such that the welds will be under compression rather than tension at the joint. The panels are normally subjected to forces tending to separate them in a direction parallel to the extent of the superposed sets of elements (for example, in this instance in the horizontal direction as viewed in FIG. 1). Any forces tending to pull the two panels apart causes the clip to actually clamp the panel elements tightly together, acting, of course, on the horizontally extending exterior panel element **15** of panel **11** and on the vertically extending exterior panel element **12** of panel **10**. The panel elements **12** and **14** are restricted in their relative lateral movement by virtue of their disposition within the lateral knee-forming extension of the legs. Forces tending to pull the panels apart will thus be resisted by the compressive forces exerted by the clip tending to hold the welded ports together and by the shear strength of the panel element welds. Since the panel elements are impressed into each other as previously described, this shear strength is substantially increased.

It is preferred that a fastener **20** be provided at each of the junctures of the horizontal elements **13** and **15**. If desired, the fasteners may also be employed to join panels which are arranged vertically or which are laid flatly. The connection between the fastener and the panels **10** and **11** has been found to be at least as strong as the panels themselves, even though the clip may be made of wire or rod which is of lighter gauge than that which is used to form the panel elements.

It may be seen that the panels 12 and 14 are constructed without any forming or bending operations such as might be required to form end loops which were heretofore commonly used to unite adjacent panels. The fasteners used to unite the adjacent panels may be manufactured easily and inexpensively on automatic machinery, and when in place the fasteners provide an exceptionally strong joint. These fasteners may be applied quickly and easily to the panels, and they may be easily removed for disassembly of the panels to permit removal and relocation thereof.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that many modifications and changes in various details may be resorted to without departing from the spirit and scope of the invention, as hereinafter claimed.

What is claimed is:

1. In combination, a pair of panels, each panel comprising two transversely disposed and joined similar sets of parallel elements, one of said sets being superposed on the other of said sets, said panels being disposed in partial overlapping registration and similarly oriented and subjected to forces tending to separate the panels in a direction parallel to the extent of the superposed sets of elements, a member having a pair of legs spaced to accommodate a panel element therebetween and joined to effect closing of said member adjacent one end thereof, said legs having aligned hook portions adjacent their free ends and laterally extending aligned knee portions intermediate said hook portions and said closed end, a superposed element of the overlapping one of said panels at the lap being disposed within the closed end of said member, the knee portions of said member extending about an adjacent element of the other of said sets of elements of the other of said panels at the lap, and the hook portions of said member being disposed outwardly of said superposed panel element of the overlapping one of said panels, and a pin disposed within and extending between the hook portions of said member whereby said member may be locked in position, the distance between said knee and a plane which passes through the interior of said hook portion and is perpendicular to a plane bisecting said knees being slightly greater than the sum of the thicknesses of said panels and the diameter of said pin.

2. In combination, a pair of panels, each panel comprising two transversely disposed and joined similar sets of parallel elements, one of said sets being superposed on the other of said sets, said panels being disposed in partial overlapping registration and similarly oriented and subjected to forces tending to separate the panels in a direction parallel to the extent of the superposed sets of elements, a member having a pair of legs spaced to accommodate a panel element therebetween and joined to effect closing of said member adjacent one end thereof, said legs having aligned hook portions adjacent their free ends and laterally extending aligned knee portions intermediate said hook portions and said closed end, the distance between said knees and a first plane which passes through the interior of said closed end and is perpendicular to a plane bisecting said knee being slightly greater than the sum of the thicknesses of said two panels, a superposed element of the overlapping one of said panels at the lap being disposed within the closed end of said member, the knee portions of said member extending about an adjacent element of the other of said sets of elements of the other of said panels at the lap, and the hook portions of said member being disposed outwardly of said

superposed panel element of the overlapping one of said panels, and a pin disposed within and extending between the hook portions of said member, whereby said member may be locked in position, the distance between said knees and a plane which passes through the interior of said hook portion and is perpendicular to a plane bisecting said knees being slightly greater than the sum of the thicknesses of said panels and the diameter of said pin.

3. The structure of claim 2 wherein said pin is provided with an enlarged head portion and a protuberant section spaced from said head portion a distance greater than the thickness of said member, whereby said pin may be releasably locked in position traversing the hook portions of said member.

4. In combination, a pair of panels, each panel comprising two transversely disposed and joined similar sets of parallel elements, one of said sets being superposed on the other of said sets, said panels being disposed in partial overlapping registration and similarly oriented and subjected to forces tending to separate the panels in a direction parallel to the extent of the superposed sets of elements, a member formed of a single elongated rod bent at approximately its midpoint to form a closed end bight and a pair of substantially coextensive uniformly spaced legs extending therefrom and adapted to accommodate aligned panel elements therebetween, said legs having aligned hook portions adjacent their free ends and laterally extending aligned knee portions intermediate said hook portions and said closed end, a superposed element of the overlapping one of said panels at the lap being disposed within the closed end of said member, the knee portions of said member extending about an adjacent element of the other of said sets of elements of the other of said panels at the lap, and the hook portions of said member being disposed outwardly of said superposed panel element of the overlapping one of said panels, and a pin disposed within and extending between the hook portions of said member, whereby said member may be locked in position and said panels may be held firmly in overlapping relationship.

5. In combination, a pair of panels, each panel comprising two transversely disposed and joined similar sets of parallel elements, one of said sets being superposed on the other of said sets, said panels being disposed in partial overlapping registration and similarly oriented and subjected to forces tending to separate the panels in a direction parallel to the extent of the suporposed sets of elements, and a fastener comprising an elongate member having means adjacent each end thereof for engaging a superposed element of the overlapping one of said panels at the lap and an intermediate laterally extending knee portion extending about an adjacent element of the other of said sets of elements of the other of said panels at the lap, whereby said panels may be interlocked in overlapping relationship.

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JACOB L. NACKENOFF, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,220,518 November 30, 1965

William Stanton Deming

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent ~~should~~ read as corrected below.

Column 2, line 6, after "corresponding" insert -- elements are aligned and so that the --; column 4, line 21, for "protruberant" read -- protuberant --; line 63, for "ports" read -- parts --.

Signed and sealed this 20th day of September 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents