SUPPORTING STRUCTURES FOR CHUTES
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This invention relates to improvements in structure for supporting and mounting a plurality of inclined chutes in rows and tiers. An example of the use of the inven-
tion is a warehouse installation where a plurality of chutes are employed, each chute serving to store articles in a row and to feed them by gravity to the lower end of the chute from which they are re-

moved or released as required.

The present invention answers the need for a chute supporting structure, which is simple to erect, and most importantly which is extremely flexible so that both the general arrangement of the structure and the mounting of individual chutes therein can easily be altered as required by changes in the operation of the facility. Such changes would include expansion of the number of chutes in the installation to handle additional articles, or changes in the arrangement of individual chutes caused by variations in the number or size of individual articles being handled, and changes caused by any combination of these factors.

In general, the structure of the invention is a sectional type, that is, it is composed of a plurality of sections or units each of which is capable of supporting a plurality of chutes in rows and tiers. Each section consists of a number of upright members extending along each side thereof, these upright members being suitably interconnected by longitudinal members to form transversely aligned pairs of uprights. A transverse frame member extends between each such pair of uprights and consists of a pair of vertical members and a plurality of horizontal members extending therebetween and connected thereto, there being one horizontal member for each tier of chutes. Means are provided for detachably connecting the vertical members of each transverse frame to the pair of uprights between which the frame extends. As a result the transverse frames stabilize the structure both transversely and vertically, and provide a plurality of chute supporting members. The width of a transverse frame is correlated with a number of standard chute widths so that a row of chutes can be supported on any horizontal frame member, these chutes either being of the same width or of different widths.

Means are provided for establishing a simple but ef-

tective detachable connection between an individual chute and at least some of the transverse frames of the sup-
porting structure, and preferably between each chute and an adjacent chute. This connecting means is of a gravity interlocking type employing no individual removable connector element. In the presently preferred form of the invention, this connecting means includes a portion on a horizontal member of a transverse frame which projects toward the upper end of the chute, prefer-
ably at the angle of chute inclination. Each chute is provided with an integrally formed downwardly extend-
ing and forwardly projecting tang or clip which can be brought into interlocked engagement with the projecting portion of the horizontal frame member on move-

ment of the chute relative to the supporting structure.

Means are also provided in the form of a detachable clip for anchoring the upper end of each chute. Prefer-
ably each chute has a pair of side walls one of which has a turned portion which will overlap the side wall of an adjacent chute thereby interlocking adjacent chutes together.

As a result the elements of the structure can be de-

tachably interlocked together. Chutes can be removed from a single row of a section merely by sliding each chute upwardly, and the arrangement of tiers in a section can be changed simply by removing the chutes and rearranging the transverse frame members or sub-

mitting other transverse frame members.

A present preferred example of the structure of the invention is shown in the accompanying drawings which include the following views:

FIGURE 1, a side elevation showing a portion of a warehouse installation where a plurality of chutes are arranged in rows and tiers to deliver articles to conveyor means located adjacent the lower ends of the chutes;

FIGURE 2, a sectional end elevation taken as indi-
cated by the line 2—2 of FIGURE 1 and showing a por-
tion of the chute supporting structure with the chutes removed therefrom;

FIGURE 3, an enlarged sectional detail taken on the line 3—3 of FIGURE 2;

FIGURE 4, a plan view showing a portion of the chute supporting structure of FIGURE 1;

FIGURE 5, a fragmentary sectional elevation of a portion of the structure of FIGURE 1 taken on the line 5—5 thereof;

FIGURE 6, an enlarged elevation partly in section showing a portion of the structure of FIGURE 1 as in-
dicated by line 6—6 thereof;

FIGURE 7, an enlarged sectional detail showing the connections between a chute and a horizontal chute support-
ing member; 

FIGURE 8, an enlarged sectional detail taken as shown by the line 8—8 on FIGURE 6; and

FIGURE 9, a perspective view showing the lower por-

tion of a typical chute.

The general arrangement of one section of the struc-

ture of the invention is shown in FIGS. 1 and 4. A number of rows of chutes 10, 12, 14, 16 and 18 are car-

ried by the structure in superimposed relation, or tiers, it being understood that the structure shown is extended over the full length of the chutes. Usually some form of conveying device such as the belt con-

veyors 20, 22, and 24, will extend along the discharge end of the rows of chutes as shown in FIG. 1, but these con-

veyors and their supporting framework generally indi-
cated by the reference 26 form no part of the present invention, being illustrated merely as an example of one setting in which the invention can be employed.

The chute supporting structure includes a suitable num-
ber of upright members 28, 29, 30, 31, located at spaced intervals along the sides of one section of the struc-
ture and interconnected by longitudinal members.

Two forms of connection between upright and longi-

dudinal members are employed in the structure disclosed.

Upright members 28 and 30, and 29 and 31 are inter-

connected by upper and lower longitudinal members 34 and 35 as by welding, to form a side frame. A similar connection is employed between longitudinal members 36 and 37, upright member 32 and the next succeeding upright member not shown, forming another side frame. Adjacent side frames are detachably interconnected by suitable upper and lower longitudinal members 38 and 39 by the use of interengaging connector elements on the upright members and on the ends of the longitudi-

nal members as shown in FIG. 8. These connector elements comprise a pair of headed pins 40 carried on the upright member and engageable in slots 41 formed in an angle section connector plate 42 secured to each end of the members 38 and 39.

Transversely of the structure, the uprights 28—29,

30—31, 32—33, are located by the longitudinal members in aligned pairs, and a transverse frame member is
employed as a connection between the uprights of each such pair. Each transverse frame member consists of a pair of vertical members 44 and 45 and one or more horizontal members 46. A single section being employed for the vertical members, a double angle or channel section for the horizontal members 46. The vertical and horizontal members 44-46 are preferably welded together to form a rigid frame unit which is standardized in size. These transverse frames are detachably connected between the transversely aligned pairs of upright members. Pairs of headed pins 48 are secured to a transversely extending face 49 of each upright member, and keyhole slots 50 are formed in a transversely extending leg 51 of the vertical frame members 44 and 45. Connector pins 48 are located on the uppers so that transverse frames are positioned at successively higher elevations so that the cross-members thereof define the slope of the chutes. Each transverse frame cross-member 46 is connected to the vertical frame members 44 and 45 with its upper flange 54 extending in the plane of inclination of a row of chutes and forming a portion which projects toward the upper end of such row as shown in FIGS. 6 and 7.

Each row of chutes consists in a plurality of individual chute members and the width of a row as defined by the length of the transverse members 46 of the frame is such that a number of chutes of different sizes can be mounted in side by side relation to form a single row. For example, referring to FIGS. 4 and 5, the upper row 18 and intermediate row 12 are made up of three chutes 57 of identical width and a slightly wider chute 56, while the lower row 10 is made up of two wide chutes 58.

Regardless of width, the chutes are all of similar construction consisting, as shown in FIG. 9, of a flat supporting surface 60 bounded by a pair of side rails 61 and 62, the side rail 62 being formed with a downturned lip 63 for overlapping engagement with the side rail 61 of an adjacent chute (FIG. 5). At intervals determined by the spacing between transverse frames, sets of tangs 64 are struck from the chute surface 60, these tongs projecting downwardly and forwardly towards the discharge end of the chute with a configuration designed for overlapping engagement with the projecting portion or flange 54 of a transverse frame cross-member 46 as best shown in FIGS. 6 and 7. It is not necessary to provide the tongs 64 on the chute at the location of all transverse frame cross-members 46, it being usually sufficient if tongs are employed for engagement with the transverse frame adjacent the discharge end of the chute and the next successive transverse frame as shown in FIG. 6. This prevents a chute from buckling upwardly if weight is supported at the discharge end alone. The remaining portion of the chute will lie flat against the surface of the members 46 of the transverse frames. At the upper end 68 of (FIG. 7) a chute, the members 46a of the transverse frame are arranged in oppositely facing relation, and a separate clip 66 is employed to detachably anchor the upper end chute 68 to the cross-members 46a. This clip consists of a strip of sheet metal having a tang 69 struck therefrom for engagement with the upper flange 70 of the member 46a and having a length sufficient to extend well beyond the end 68 of the chute. After the chute has been mounted with its tangs 64 engaging the other horizontal frame members 46, the projecting portion 72 of the clip 66 is bent into overlapping relation with the upper end of the chute surface 60. Not only does the clip 66 thereby provide a means for detachably mounting the upper end of each chute, but it also provides a connection which automatically compensates for minor variations in chute length or variations in chute positioning resulting from manufacturing tolerances in the attachment of the tangs 64.

The manner in which the structural unit of the invention is assembled seems obvious from the foregoing de-
scription. Once the framework consisting of the upright members, longitudinal members and transverse frames have been interconnected, the chutes required for each section are simply slid downwardly into position, an interlocking gravity-maintained connection being automatically established between each chute and certain of the transverse frames and between each chute and an adjacent chute. The only separate connecting elements employed—the clips 66—are then installed at the upper ends of the chutes.

Successive sections can be added as required for the total number of chutes to be mounted by employing additional transverse frame uprights and longitudinal members, one upright becoming common to adjacent sections as shown in FIGS. 3 and 4.

While preferred embodiments have been described above in detail, it will be understood that numerous modifications might be resorted to without departing from the scope of the invention as defined in the following claims.

1. A structure for supporting a plurality of inclined article storage chutes in tiers including at least a pair of side frames each formed of interconnected upright and longitudinal members, and a pair of transverse frames, each of said transverse frames consisting of a unit including a pair of said horizontally extending members and a plurality of vertically spaced horizontal chutes rigidly connected between said pair of vertical members, means for detachably connecting each of said transverse frame units between a transversely aligned pair of upright members of said side frame, means for detachably connecting a chute to at least one of said horizontal chute supporting members, said connecting means being engageable upon relative movement of a chute to a chute supporting member in a direction longitudinally of such chute and towards the discharge end thereof, said connecting means including a portion on said horizontal chute supporting member which projects towards the upper end of the chute and a downwardly projecting tang on said chute extending towards the lower discharge end thereof for overlapping gravity urged engagement with said projecting portion over said chute supporting member, and a clip member having a portion engageable with a horizontal chute supporting member adjacent the upper end of a chute and a second portion adapted to overlappingly engage the upper end of a chute.

2. A chute supporting structure according to claim 1 further characterized by the said vertical members of said transverse frames each having a pair of angularly related surfaces, and said upright members each having a pair of corresponding angularly related surfaces, said transverse frame connecting means being located on one of said surfaces of said vertical frame members and the corresponding one of said surfaces of said upright members, said connecting means being engageable upon movement of said transverse frame relative to the pair of upright members to which it is connected.

3. A chute supporting structure according to claim 1 further characterized by means for detachably interlocking a chute with at least one adjacent chute, said interlocking means comprising a pair of vertically spaced horizontal members which includes a clip extending outwardly and downwardly for overlapping sliding engagement with a side rail of an adjacent chute.

4. In a chute structural having upright members and horizontal members for supporting inclined chutes upon which a chute rests, one of said horizontal members being located adjacent the lower discharge end of a chute and another of said horizontal members being located adjacent the upper end of a chute, means for detachably mounting a plurality of chutes on said structure in side-by-side relation comprising a tang extending below said chute and toward the lower discharge end thereof and a portion on said one horizontal member adapted to be
overlappingly engaged by said tang upon downward movement of said chute relative to said horizontal member, a clip member having a portion engageable in overlapping relation with the other of said horizontal members and a second portion deformable into overlapping engagement with the upper end of said chute including a lip extending outwardly and downwardly for overlapping sliding engagement with a side rail of an adjacent chute.

5. In a chute structure having upright members and horizontal members for supporting inclined chutes upon which a chute rests, one of said horizontal members being located adjacent the lower discharge end of a chute and another of said horizontal members being located adjacent the upper end of a chute, means for detachably connecting a chute to said structure comprising a tang extending below said chute and toward the lower discharge end thereof and a portion on said one horizontal member adapted to be overlappingly engaged by said tang upon downward movement of said chute relative to said horizontal member, a clip member having a portion engageable in overlapping relation with the other of said horizontal members and a second portion deformable into overlapping engagement with the upper end of said chute.

6. In a chute structure having upright members and horizontal members for supporting inclined chutes upon which a chute rests, one of said horizontal members being located adjacent the lower discharge end of a chute and another of said horizontal members being located adjacent the upper end of a chute, means for detachably connecting a chute to said structure comprising a tang extending below said chute and toward the lower discharge end thereof and a portion on said one horizontal member adapted to be overlappingly engaged by said tang upon downward movement of said chute relative to said horizontal member, said other horizontal member including a flange portion extending toward the lower discharge end of said chute, a clip member having a portion engageable in overlapping relation with the said flange portion of said other horizontal member, and a second portion deformable into overlapping engagement with the upper end of said chute.

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