Sept. 21, 1948. R. E. HOLMES 2,449,849

LOCKING MEANS FOR FLEXIBLE CHUTES

Filed June 12, 1945 3 Sheets-Sheet 1

Fig. 1

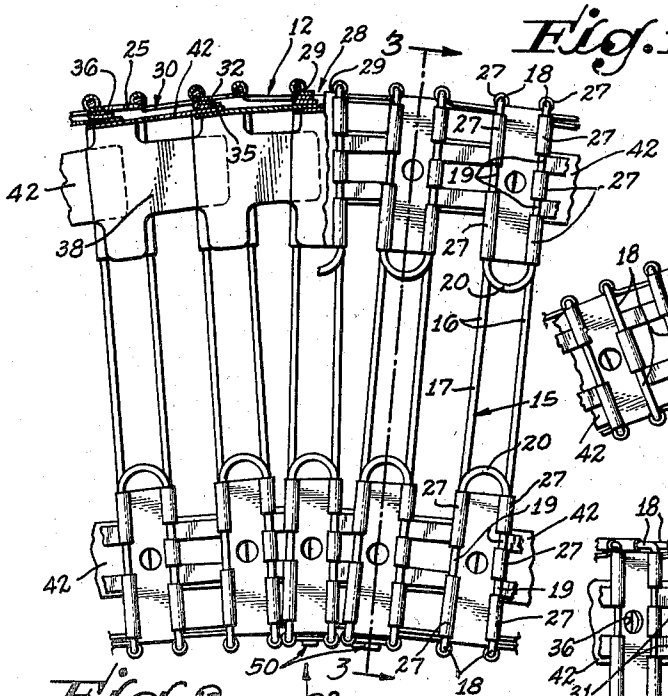


Fig. 4

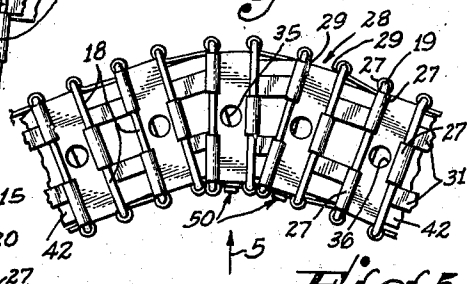


Fig. 5

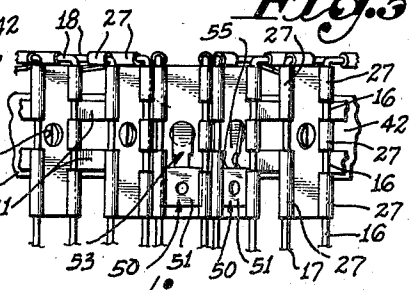


Fig. 2

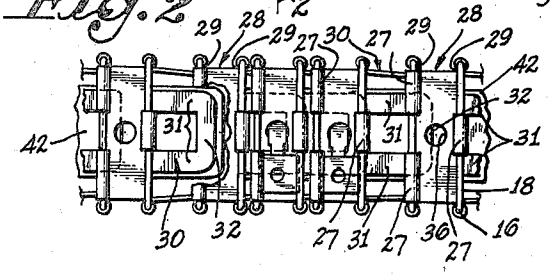


Fig. 6

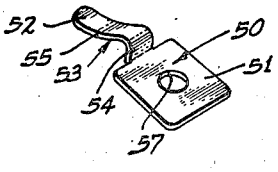
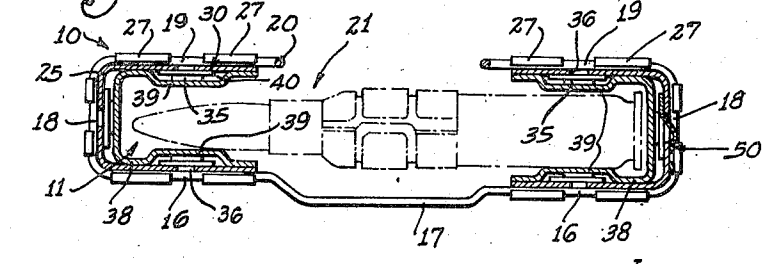


Fig. 3



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LOCKING MEANS FOR FLEXIBLE CHUTES

Filed June 12, 1945 3 Sheets-Sheet 2

Fig. 7

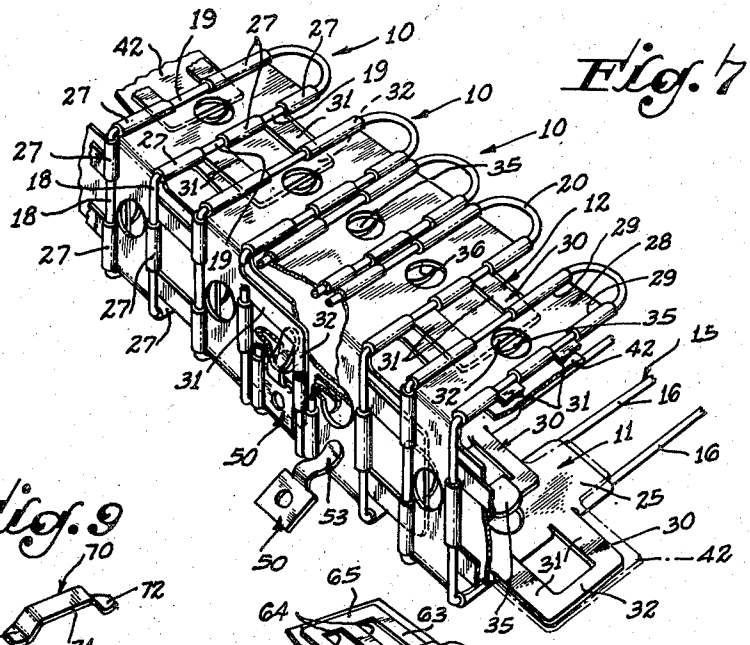


Fig. 9

Fig. 8

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LOCKING MEANS FOR FLEXIBLE CHUTES

Filed June 12, 1945 3 Sheets-Sheet 3

Fig. 10

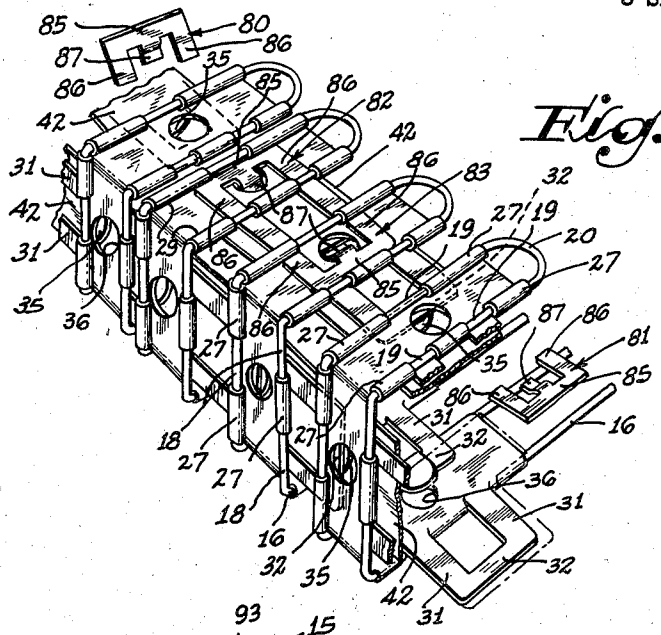


Fig. 11

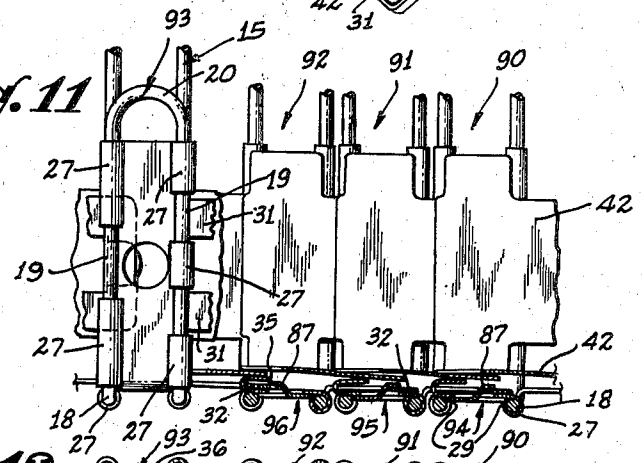
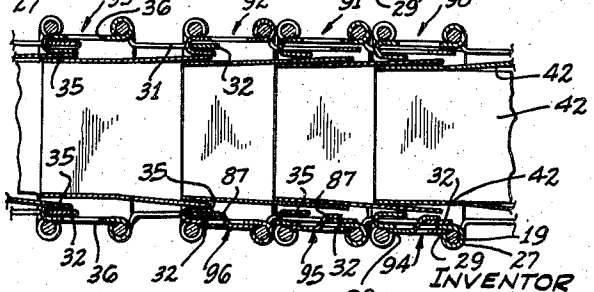


Fig. 12



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Patented Sept. 21, 1948

2,449,849

UNITED STATES PATENT OFFICE

2,449,849

LOCKING MEANS FOR FLEXIBLE CHUTES

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Application June 12, 1945, Serial No. 599,111

13 Claims. (Cl. 193—25)

1

My invention relates to a flexible or expansible articulated structure or feed chute for guiding the movement of a flexible member from one position to another, and to a novel means for locking such structure or feed chute at selected positions to determine its ultimate form or to prevent flexure, expansion, or contraction at selected positions.

Such an articulated structure is useful as a conduit, chute, conveyor, duct, or the like for guiding any flexible member, the term "flexible member" being herein used in a broad sense to include a unitary or articulated member or merely a series of adjoining articles, whether or not interconnected. The invention will be particularly exemplified with reference to known flexible chutes for feeding a belt of ammunition to a machine gun or cannon from an ammunition box, though it should be clear that it is not limited thereto.

The articulated structures or feed chutes to which the invention is particularly applicable are those having a plurality of interlinked units extending transversely of and outlining a member-guiding passage, the interlinking permitting limited expansive and compressive relative movement of the units at different positions around the member-guiding passage. One of the important objects of the invention is to provide for the locking of adjacent units at a selected position or positions.

One conventional interlinkage means of such articulated feed chutes comprises a link member on each transverse unit linked with a hook member on an adjacent transverse unit and permitting and guiding movement of the units toward and away from each other, the hook limiting the separation of the units. Further, the transverse units are constructed identically, each with a plurality of link members and hooks, so that the chute can be assembled of such units, the link and hook members interlocking upon assembly. On the other hand, means is usually provided for disconnecting the units to permit inspection or repair or replacement of individual units. This is conventionally accomplished by providing an uncoupling opening giving access to the hook member and/or the link member to unlock the linkage by temporary deformation of one or both of these members.

It is an object of the invention to provide a locking member detachably connectable to a chute formed of interlinked transverse units to rigidify the chute at the point of connection

2

or limit its movement relative to an adjacent unit at the point of connection.

Another object is to provide a locking member of this type which is simple, inexpensive, and easily inserted at the selected locking position without the use of special tools, and which is positively retained in position to prevent withdrawal due to vibration or accidental contact.

Other objects of the invention include the provision of a locking member attachable to the chute to engage the interlinkage means between transverse units; a locking member having a locking portion insertable through the usual uncoupling opening of a chute to engage the interlinkage means in a manner to prevent or limit collapsing and/or expanding of transverse units adjacent the locking member; a locking member having an attachment portion detachably connectable to the chute and a locking portion insertable through an uncoupling opening of the chute; and a locking member insertable to extend into the normal path of movement of the link member to impede such movement.

Further objects and advantages will be apparent to those skilled in the art from the following description of exemplary embodiments.

Referring to the drawings:

Fig. 1 is a plan view, partially in section, of a segment of one form of articulated ammunition chute flexed in its longitudinal plane, showing placement of two locking members to rigidify a portion of this segment;

Fig. 2 is a side view, taken as indicated by the arrow 2 of Fig. 1;

Fig. 3 is a sectional view, taken along the line 3—3 of Fig. 1;

Fig. 4 is a side view of the same form of chute flexed laterally, showing placement of two locking members in the bottom of the chute to rigidify the adjacent portions;

Fig. 5 is a bottom fragmentary view, taken as indicated by the arrow 5 of Fig. 4;

Fig. 6 is a perspective view of a locking member for this form of chute;

Fig. 7 is a perspective fragmentary view of the same form of chute, partially broken away to show internal constructional features, with one locking member in place and another in position preparatory to insertion;

Fig. 8 is a perspective view of a segment of another form of chute with two locking members of different construction in position;

Fig. 9 is a perspective view of a locking member for the form of chute shown in Fig. 8;

Fig. 10 is a fragmentary perspective view of

the chute of Fig. 7, showing an alternative locking member and its mode of application to the chute;

Fig. 11 is a top view, partially in section, of a portion of a chute showing three locking members positioned along a side of the chute; and

Fig. 12 is a sectional view, taken vertically through one side of the type of chute shown in Figs. 10 and 11, showing three locking members positioned along the bottom of the chute.

The particular forms of chutes herein-disclosed are not, per se, a part of the present invention. The form shown in Figs. 1 to 7 and 10 to 12, inclusive, is disclosed in detail in copending application Serial No. 535,476, entitled "Flexible feed chute," and will not be described in great detail in the instant application as the following brief description, taken with the accompanying drawings, will suffice to show the mode of connection and utility of the invention.

Referring particularly to Figs. 1 to 7, the chute is made up of identical transverse units 10 pressed together serially to form a member-guiding passage 11, and expansibly and contractably linked by an interlinkage means 12. Each transverse unit includes a frame 15 formed of wire bent with abutting ends to form two parallel base wires 16 with offsets 17, two parallel side wires 18 at each end of the base wires, and two parallel top wires 19 extending inward from the side wires 18 on each side and connected by a curved segment 20, the curved segments 20 on each side being spaced to form a longitudinal opening 21 along the chute giving access to the passage 11.

Each transverse unit includes, also, two U-shaped attachment members 25, respectively disposed within the sidewardly-spaced U-shaped portions of the frame 15. These attachment members serve the dual purpose of retaining, properly spaced, the paired wires 16, 16; 18, 18; 19, 19, and of retaining the interlinkage means 12 corresponding to this transverse unit. For the former purpose, each attachment member is formed with tabs 27 which are bent outward and thence inward around the adjacent portions of the wire of the frame to encircle and embrace these portions. There is thus formed along all external faces of the transverse unit a shallow channel 28 bounded by tab-formed or wire-formed walls 29, see particularly Figs. 2 and 7. The encirclement of each tab, relative to its embraced wire, may be complete or partial. In the former instance, the end of the tab will engage the outer surface of the attachment member, but will preferably follow the periphery of the wire even to the end of the tab, whereby the shallow channel 28 will be bounded, at its sides and near its bottom, by inwardly-diverging walls which may be used to retain the locking member of the invention in place, as will be later described. In the latter instance, the end of the tab may terminate a short distance from the outer surface of the attachment member to provide a small space between such outer surface and the end of the tab for receiving the locking member of the invention.

The interlinkage means includes, on each attachment 25 of each transverse unit, a link means or eye means in the form of a plurality of link members 30, each comprising two arms 31 and an end bar 32, best shown in perspective in Fig. 7, along with a mating hook means, shown as comprising a corresponding number of hook members 35 positioned to engage the link members of an adjacent transverse unit. As best shown near the fore corner of Fig. 7, engagement between the bottom of a hook member 35 and the end bar 32 of the link member of an adjacent transverse unit determines the maximum spacing of the adjacent transverse unit so long as the link member remains hooked. Adjacent transverse units can be unhooked by inserting a tool, such as a small screwdriver, through an uncoupling opening 36, adjacent the hook member, and relatively springing the hook member and the link member to permit the latter to clear the cavity of the former, thus releasing the motion-limiting engagement at this point. Minimum spacing of any two transverse units is determined by engagement of their wire-encircling tabs 27. During movement toward such minimum-spaced or collapsed position, the link member slides very near or in surface contact with the interior surface of the attachment member of the adjacent transverse unit.

Each transverse unit includes also a U-shaped guide member 38 within each attachment member and suitably secured thereto, as by spot welding, to form a lining therefor. The upper and lower portions of each U-shaped guide member are offset to provide lands 39, see Fig. 3, beneath which are link-member-receiving cavities 40 within which are the hook members 35. Extending from the upper, side, and lower portions of each guide member to underlie the three corresponding link members 30 are three extensions or tongues 42. The tongues of adjacent transverse units slidably overlap at all times during relative movement of the units and form an articulated lining for the member-guiding passage 11 serving to engage the belted or linked ammunition, suggested in dotted lines in Fig. 3.

Such a structure interconnects adjacent transverse units for independent but limited movement at several positions around the periphery of the chute passage 11. The chute can be collapsed or expanded longitudinally; flexed longitudinally in the central plane of the chute passage 11; flexed laterally so that the central plane of the passage is concentric with an axis above or below the passage; flexed about the longitudinal axis of the passage (due to the flexibility of the transverse units and the interlinkage means); or twisted into various geometric or sinuous patterns. These chutes are usually designed to prevent any sharpness of turn which cannot be readily followed by the ammunition belt or other flexible member without binding.

It is often desirable to lock some section of the chute against expansion or contraction, e. g., to lock one peripheral portion of the chute at a selected position to give the chute a predetermined curve at such position. The present invention includes a simple locking member attachable to the chute at such selected position to hold the adjacent interlinkage means either fully expanded or fully contracted. The spacing of any two adjacent transverse units, at one or all of the positions around the periphery of the chute passage, can thus be predetermined or fixed and the chute can be rigidified at selected longitudinal or peripheral positions.

Fig. 6 shows one form of locking member, indicated generally by the numeral 50, for the chute construction shown in Figs. 1 to 7. It includes a plate-like, chute-engaging attachment portion 51 of a width to be pressed snugly into the shallow peripheral channel 28 in frictional engagement with the walls 29, e. g., the inwardly-converging walls provided near the bottom of the channel

by the bent tabs or by the wires. Alternatively, it can extend into the small space, previously described, between the outer surface of the attachment member and the innermost end of the bent tab to be locked in place.

The locking member 50 also provides a locking portion 52, shown as the forward end of a tongue 53 bent to extend upward at 54 and then forward and downward at 55 to a rounded tip, forming the locking portion 52. The tongue 53 and locking portion 52 are of such shape, size, and position as to extend into a selected one of the unlocking openings 36 and engage the end bar 32 of the adjacent link member 30 to limit or prevent its movement. Preferably, the locking portion 52 lies just below the level of the attachment portion 51. When the latter engages the outer surface of the chute, the locking portion thus extends into the interior of the chute structure in the normal path of movement of a link member.

Usually, it suffices to utilize a locking member insertable when adjacent transverse units are in closest proximity or collapsed position. In this instance, illustrated in the drawings, the tongue 53 can be made of a width only slightly less than the uncoupling opening 36 and, with the usual chute construction, will extend in contact with or very close to the inner surface of the end bar 32 to substantially lock the structure at this point against any movement. If the chute design is such that this inner surface of the end bar 32 more than clears the opening 36, insertion of the locking member will preclude all but a small amount of relative movement between the adjacent units at this point. By the same token, if it is desired to lock adjacent units when in expanded position, the tongue 53 should be of a width to occupy the space between the outer surface of the end bar 32 and the opposed side of the opening 36.

An opening 57 can be formed in the attachment portion 51, if desired, to aid in removing the locking member. Usually, however, the locking member can be removed by inserting a screwdriver beneath the rear of the tongue 53 and prying upward.

Usually, the desired limitation of motion between adjacent transverse units 10 can be obtained by the exclusive use of the locking members 50 in the openings 36 at the top and/or bottom of the chute, as suggested in Figs. 4 and 5 but, if desired, they can be used at the sides of the chute, as suggested in Figs. 1, 2, 3, and 7.

With the modified form of chute shown in Fig. 8, the transverse units are formed without a wire frame but with passage-outlining, sheet metal, transverse or attachment members 60 bent to form reinforcements 61. Positioned at the top and bottom positions, as previously described, are link members 63 of a double type providing two openings 64 closed by an end bar 65. Correspondingly, two hook members 66 are used in the relationship shown in Fig. 8, these being respectively opposite two uncoupling openings 67. An articulated passage lining is provided by guide members 68 having tongues 69 slidably overlapping as between the different transverse units.

To lock selected sections of such a chute, a locking member 70, shown in Fig. 9, may be employed. This includes tongues 72 and 73 at opposite ends of a chute-engaging portion, shown as comprising a bridge portion 74, these tongues being of a size to extend respectively through the paired uncoupling openings 67 into the path of movement of the end bar 65 to lock the chute

at this position in a manner previously described. One end of this type of locking member can, as before, be considered as an attachment portion engageable with the chute to anchor the other tongue-providing end which serves the locking function. Preferably, however, this embodiment actually serves this function at each of its ends.

This type of locking member 70 can be inserted by placing one end in one of the uncoupling openings and bowing the bridge portion 74 slightly with a long-nose pliers until the other end enters the other opening. The spring material of which the locking member is formed will then straighten and lie substantially flat against the surface of the member 60, spreading the tongues at the ends and preventing accidental withdrawal. Removal can be effected by use of a small screwdriver forced under the bridge portion.

Figs. 10, 11, and 12 show an alternative form of locking member for the first-described chute construction. This alternative form of locking member differs in its construction and in the fact that its locking tongue extends longitudinally of the chute, rather than transversely or peripherally of the chute passage, as in the forms previously described. Fig. 10 shows two of these locking members 80 and 81, respectively in positions preparatory to insertion to effect locking of transverse units in collapsed or expanded position; also, two locking members 82 and 83 in inserted position to lock the transverse units in these respective positions.

Each of such locking members is substantially E-shaped and includes a bridge portion 85 and two end arms 86 forming the attachment portion of the locking members, the central arm, shown at 87, comprising the tongue previously described. As before, this tongue is bent so that its end is offset from the plane including the bridge portion 85 and the end arms 86 so that this tongue can be extended through an uncoupling opening to obstruct the movement of the end bar 32 of the link member 30 thereadjacent by extending into the locus of motion of this end bar. As before, the chute-engaging attachment portion of the locking member is of such size as to be pressed snugly into the shallow peripheral channel 28 in frictional engagement with the walls 29 thereof, the bridge portion 85 and the ends of the arms 86 engaging either the inwardly-converging walls at the bottom of the channel or, as is here preferred, extending beneath the innermost ends of the bent tabs to extend into the small spaces between such ends and the outer surface of the attachment member. In either instance, the locking member will be rigidly held in place against accidental removal until a screwdriver or other tool is used to pry it from the shallow channel 28.

This alternative form of locking member is particularly advantageous where it is to be used either to lock two transverse units in either collapsed or expanded position. In the former instance, the locking member will be pressed into the shallow channel with the transverse units collapsed and with the tongue or central arm 87 extending in the direction in which the link members 30 extend, see the locking members 80 and 82 of Fig. 10. The tongue then engages the inner wall of the end bar 32. If used to lock two transverse units in expanded position, the units will be moved apart and the locking member will be pressed into the shallow channel with its tongue or central arm 87 extending in an opposite direction to engage the outer wall of the end

bar 32, see the locking members 81 and 83 of Fig. 10.

These relationships are also shown in Fig. 11, wherein four transverse units 90, 91, 92, and 93 are shown. Here, the locking members are indicated by the numerals 94, 95, and 96 and are shown as applied to the sides of the chute. The locking members 94 and 95 are inserted in a manner to lock the transverse units 90, 91, and 92 in collapsed position, while the locking member 96 is inserted oppositely to lock the transverse units 92 and 93 in expanded position. Similarly, Fig. 12 shows the same transverse units and the same locking members, serving the same respective functions but with the locking members applied to the base or bottom of the chute.

Various changes and modifications can be made without departing from the spirit of the invention as defined in the accompanying claims.

I claim as my invention:

1. In a flexible feed chute, the combination of: a plurality of transverse units disposed side by side to outline a member-guiding passage; an interlinkage means for interconnecting said transverse units for limited movement in a direction toward and away from each other, and at a plurality of positions around the periphery of said passage, said interlinkage means including a hook means on each transverse unit and a link means on each transverse unit engageable with and movable relative to said hook means of an adjacent transverse unit; and means detachably connected to one of two adjacent transverse units for restricting relative movement between these adjacent transverse units in at least one peripheral position, said means including means extensible into the path of movement of said link means relative to said hook means to impede such movement.

2. In a flexible feed chute, the combination of: a plurality of transverse units disposed side by side to outline a member-guiding passage; an interlinkage means for interconnecting said transverse units for limited movement in a direction toward and away from each other, and at a plurality of positions around the periphery of said passage, said interlinkage means including a hook means on each transverse unit and a link means on each transverse unit engageable with and movable relative to said hook means of an adjacent transverse unit, there being an opening in each transverse unit adjacent and giving access to said hook means thereof; and means detachably connected to one of two adjacent transverse units for restricting relative movement between these adjacent transverse units in at least one peripheral position, said means including means extensible through said opening into the path of movement of said link means relative to said hook means to impede such movement.

3. In combination with a transverse unit of a flexible feed chute slidably receiving a link member of an adjacent unit, a locking member including an attachment portion removably connectable with said transverse unit and a locking portion extending into the path of movement of said link member when said attachment portion is connected to said transverse unit.

4. As an article of manufacture, a locking member for attachment to a transverse unit of a flexible feed chute to rigidify a linkage connecting same relative to an adjacent unit, said locking member including an attachment portion detachably connectable with said transverse unit and a locking portion extending into rigidifying relationship with said linkage when said attachment portion is connected to said transverse unit.

5. As an article of manufacture, a locking member for attachment to a transverse unit of a flexible feed chute having a shallow wall-bounded peripheral channel to rigidify a linkage movably connecting said transverse unit to an adjacent unit, said locking member having an attachment portion of a size to fit snugly in said shallow peripheral channel in engagement with its bounding walls and said locking member having a locking portion extending into rigidifying relationship with said linkage when said attachment portion is in said shallow channel.

6. As an article of manufacture, a locking member for attachment to a transverse unit of a flexible feed chute interconnected with an adjacent unit by a link member of the adjacent unit and having an opening adjacent the path of movement of said link member, said locking member having an attachment portion engageable with said transverse unit and a tongue extending from said attachment portion and positioned to extend through said opening into the path of travel of said link member.

7. As an article of manufacture, a locking member for rigidifying selected portions of a flexible feed chute, said locking member providing a chute-engaging portion conforming in shape to a portion of said feed chute and a tongue extending from one portion of said chute-engaging portion and bent out of the plane of said chute-engaging portion, the forward end of said tongue forming a locking portion.

8. An article as defined in claim 7, in which said tongue is integral with said one portion of said chute-engaging portion and extends upward therefrom and then downward to said locking portion, said locking portion lying just below the level of said chute-engaging portion.

9. An article as defined in claim 7, including another tongue extending from an opposite portion of said chute-engaging portion in a direction opposite to said first-named tongue and bent out of the plane of said chute-engaging portion to provide another locking portion.

10. An article as defined in claim 7, in which the locking member is substantially E-shaped to provide a bridge portion and two end arms cooperating in defining said chute-engaging portion, and a central arm comprising said tongue.

11. As an article of manufacture, a locking member for a flexible feed chute, said chute comprising a plurality of transverse units disposed side by side to outline a member-guiding passage, adjacent transverse units being expansibly linked to each other by a link means extending from one adjacent unit to the other, the other adjacent unit having an opening adjacent which an element of the link means moves, said locking member providing a first portion adapted to extend along the surface of said other adjacent unit and providing a second portion comprising a tongue extensible through said opening to extend into the path of movement of said element of said link means to restrict such movement.

12. An article of manufacture as defined in claim 11 in which said element of said link means includes front and rear portions, and in which said first and second portions of said locking member are shaped for reversible disposition relative to said other transverse unit to extend said tongue selectively through said opening in two positions to engage selectively said front and rear portions of said element of said link means

and lock the two adjacent transverse units selectively in extended or contracted position relative to each other.

13. As an article of manufacture, a locking member for attachment to a transverse unit of a flexible feed chute comprising a plurality of such transverse units with linkages movably connecting each transverse unit to its adjacent transverse unit, said locking member being adapted to restrict relative movement of such adjacent transverse units and retain same selectively in a collapsed position in which adjacent parts of said adjacent transverse units are close together or in an expanded position in which said adjacent parts are more widely spaced from each other, each transverse unit having a shallow channel bounded by side walls and a bottom wall, said bottom wall having an opening adjacent which one of said linkages moves during relative movement between said adjacent transverse units, said locking member including an attachment portion of a size to fit snugly in said shallow channel in engagement with said side walls and including a locking portion extending through

said opening to engage one portion of said linkage when said attachment portion is in one position in said shallow channel and said adjacent transverse units are in collapsed position to prevent movement thereof to said expanded position, said attachment portion being reversibly insertable into said shallow channel when said adjacent transverse units are in expanded position to extend said locking portion through said opening to engage another portion of said linkage and prevent movement of said adjacent units to said collapsed position.

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