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METHOD OF MAKING HINGES

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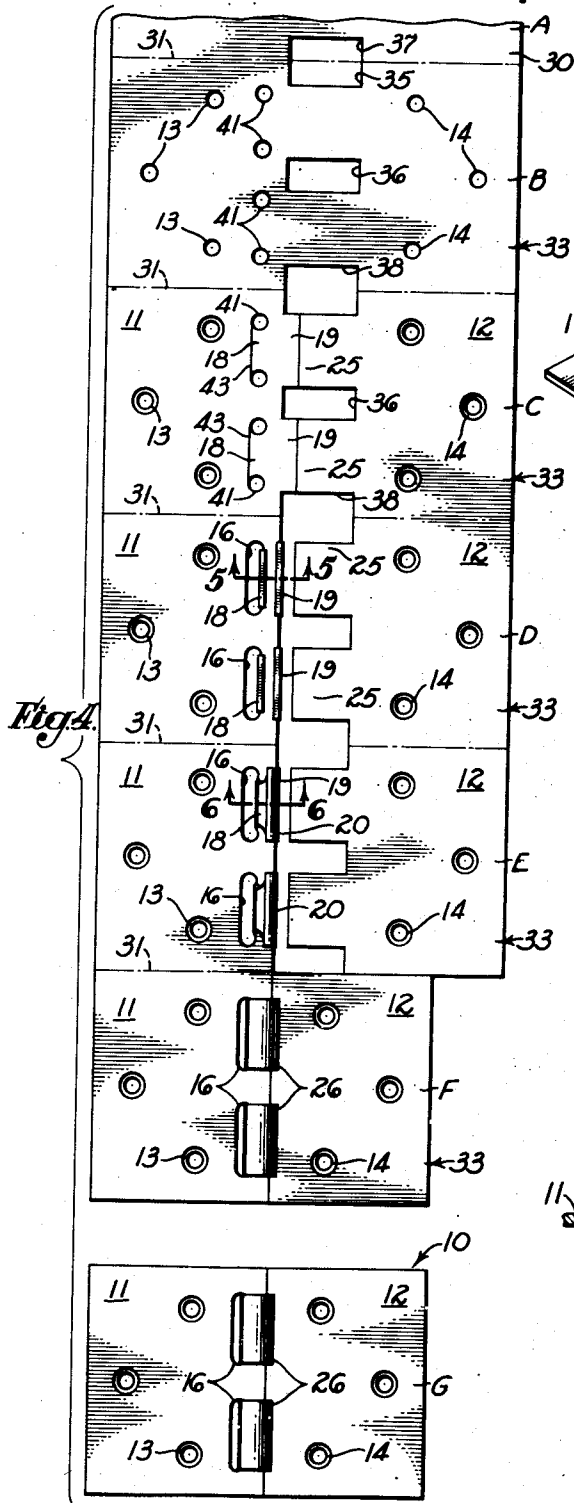


Fig. 1.

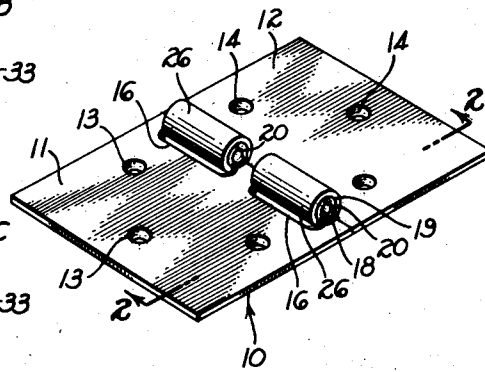


Fig. 2.

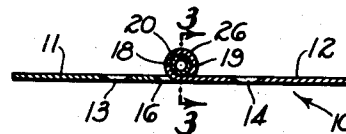


Fig. 3.

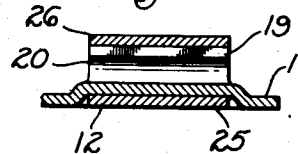
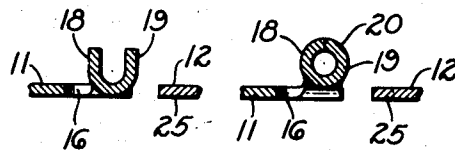


Fig. 5.

Fig. 6.



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METHOD OF MAKING HINGES

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5 Claims. (Cl. 29—11)

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My invention relates generally to hinge devices and particularly to an improved flap hinge and method of making the same.

Hinge devices which are commonly employed for pivotally connecting various objects such as doors, covers and the like usually comprise a pair of complementary flaps or leaves having aligned loops through which a hinge pin extends to pivotally connect the leaves, the ends of the hinge pin being headed or upset to retain the pin in place. It is essential that the hinge loops be accurately formed to provide relative rotation of the hinge leaves on the hinge pin and to avoid excessive looseness between the parts. The component parts of such hinges are usually assembled by aligning the loops of the leaves, inserting the hinge-pin and thereafter upsetting the ends of the pin to retain the parts in assembled relationship and this assembling operation is time-consuming and adds to the cost of the hinge device.

Various expedients have been proposed for eliminating the use of hinge pins in hinges of the flap or leaf type whereby to reduce the cost of the hinges to a minimum, one such hinge comprising a leaf member having an integral crossbar and an opening adjacent said crossbar, and a second leaf member having a loop-like ear hooked around the crossbar to pivotally connect the two leaves. While this type of hinge is relatively simple in construction and inexpensive to manufacture, it has been determined that the crossbar and the bearing loop are so formed that considerable play exists therebetween and thus the hinge is unsuitable for use where a secure and accurate hinge joint is required. It is therefore the primary object of my invention to provide a hinge of the flap type in which one leaf member has a crossbar of tubular cross section and the other leaf member has a bearing loop curled around said tubular crossbar to embrace the same with an accurate fit whereby to permit free relative rotation between the hinge leaves while preventing excessive looseness therebetween.

Another object is to provide a hinge of the character referred to in which the crossbar is formed as an integral part of one of the leaf members and located out of the plane of said leaf member to adapt the hinge to be placed flat against the objects which are to be hinged together.

Another object is to provide a hinge of the type indicated which is extremely simple in construction and which lends itself to mass production methods whereby to reduce its cost to a minimum.

Another object is to provide a method of producing my improved hinge, such method including

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several steps which, when carried out in proper sequence, adapt the two leaves of the hinge to be simultaneously fabricated from a single sheet or from separate sheets of material and assembled in hinged relationship without the use of a separate hinge-pin or other connecting element.

Another object is to provide a method of fabricating and assembling the leaves of hinges in a continuous process and which includes the steps of intermittently advancing a substantially continuous strip of material to present successive portions thereof to different stations or locations, said portions constituting blanks from which said hinges are fabricated, providing apertures in a blank at one location, severing the blank between said apertures longitudinally of the strip at another location to divide the blank into a first and a second leaf member each having a projecting ear, providing a tab on said first leaf member while in said position, curling the tab and ear of said first leaf member toward each other while the blank is at another location to provide a tubular crossbar thereon and an opening adjacent said crossbar, parting the second leaf member from the strip, moving the second leaf member toward said first leaf member and simultaneously passing the ear of said second leaf member through the opening of the first leaf member and curling said ear around said crossbar to pivotally connect said leaf members while said blank is located at another position, and finally parting the first leaf member from the strip to complete the hinge.

Further objects of my invention will be apparent from the following specification and the drawing, which is for the purpose of illustration only, and in which:

Fig. 1 is a perspective view of my improved hinge;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a vertical sectional view through one of the hinge connections, taken on line 3—3 of Fig. 2;

Fig. 4 is a composite plan view illustrating the various steps of the method employed when fabricating my improved hinges from a substantially continuous strip of material;

Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 4; and

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 4.

Referring first to Figs. 1, 2 and 3 of the drawing, my improved hinge 10 comprises a pair of leaf members 11 and 12 constructed from sheet metal and provided with countersunk holes 13 and 14,

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respectively, through which attaching screws (not shown) may be inserted and screwed into the objects which it is desired to pivotally connect by means of the hinge. The leaf member 11 has a pair of elongate openings 16 adjacent its inner end and the inner edges of the openings are bent upwardly and laterally to provide transversely extending semi-circular tabs 18. At its inner edge, in alignment with the tabs 18, are transversely extending semicircular ears 19, the upper edges of which abut the upper edges of the tabs 18. The semicircular tabs 18 and ears 19 together provide a pair of transversely spaced tubular crossbars 20 arranged adjacent to the openings 16. The crossbars 20 are elevated from the plane of the leaf member 11 a distance substantially equal to the thickness of the metal of the leaf member as shown in Fig. 3. Each of the openings 16 may be formed by first punching a pair of transversely-spaced holes and thereafter slitting the metal between and tangentially of the holes to form, in effect, a three-sided slit, the material between the sides of the slit being adapted to be curled upwardly out of the plane of the leaf member 11 to form the curved tab 18. In other cases, however, the metal may be formed with a U-shaped slit during the punching operation to provide the tab 18.

The companion leaf member 12 consists of a flat plate having a pair of transversely spaced ears 25 projecting from its inner end or, in other words, from that end which is disposed adjacent the leaf member 11. The ears 25 are of a width slightly less than the length of the elongate openings 16 of the member 11 to adapt them to be inserted therethrough. The ears 25, after passing through the openings 16, are curled or looped around the tubular crossbars 20 to form bearing loops 26 which completely encircle the crossbars with a relatively close fit, as shown in Fig. 2, to connect the leaf members for relative pivotal movement.

It is to be particularly noted that my improved hinge 10 is provided with pivotal connections comprising crossbars and bearing loops which are completely circular in cross section and thus a maximum bearing surface is effected and the leaf members 11 and 12 are prevented from tilting in a transverse direction. The improved pivotal connection between the leaf members is as efficient in operation as the usual pin-and-loop connections employed in previous types of hinges and, because of its simplicity, may be produced more economically. While the drawing illustrates the hinge as including two crossbars 20 and bearing loops 26, it will be obvious that a single pivotal connection or a plurality of such connections may be employed, depending primarily upon the size and shape of the hinge, it being understood that the leaf members may take other shapes than those herein illustrated when hinges of the common T and "strap" types are to be made and that either member may be provided with an offset portion to adapt the hinge for use with panel type doors.

It has been explained that my improved hinge is adapted for mass production and my invention provides a preferred method for effecting such manufacture. Preferably, the hinges 10 are fabricated from a single or pair of substantially continuous strips of sheet metal, the individual leaf members being struck up in suitable dies, parted from the remainder of the strips and assembled automatically to complete the hinges. Referring

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to Fig. 4, of the drawing, the method of producing the hinges is graphically illustrated as consisting of several preferred steps which are carried out in the manner indicated at A, B, C, D, E, F and G in this view. As shown in Fig. 4, by way of example, the complete hinges 10 which consist of the two leaf members 11 and 12 are adapted to be fabricated from a substantially continuous strip 30 of sheet metal. The strip 30 may be advanced intermittently to present successive portions thereof to the stations or positions A to G, at which positions these portions are operated upon in step-by-step order to ultimately produce the finished hinge 10. The strip 30 may be advanced between operations by any suitable feeding means and the various operations may be performed by any preferred fabricating means, the present invention being concerned only with the steps for carrying out the method and is not to be considered limited to any particular means for effecting the specific operations.

Assuming that the strip 30 has been advanced to locate a portion thereof at the position indicated at A, this portion which is bounded by the lateral edges of the strip and a pair of the longitudinally-spaced dot-and-dash lines 31 may be considered a blank 33 from which the complete hinge 10 is to be fabricated. After the blank 33 has been positioned at A it is pierced to provide rectangular apertures 36 and 37 which are spaced longitudinally of the strip 30, the aperture 36 being disposed at the center of the blank 33 while the apertures 37 are located on the boundary lines 31 between adjacent blanks. After being pierced at position A, the strip 30 is advanced to dispose the first blank 33 at station B and to position a second blank portion of the strip at A. At position B, the apertures 37 are widened by a piercing operation as indicated at 35 to provide relatively wide rectangular apertures or openings 38. At this station the blank 33 is also punched to provide a plurality of attachment holes 13 and 14. At one side of the blank 33 between the holes 13, 14 and the apertures 35, 36 and 37 two pairs of holes 41 are punched. The apertures 36 and 38 and the holes 13, 14 and 41 may be punched or pierced in suitable dies in the manner well known to those versed in the art.

After being operated upon at position B, the strip 30 is advanced a distance equal to the width of the blank 33 to dispose the first blank in the location indicated at C and to locate the next succeeding blank of the strip at position B. At position C the holes 13 and 14 of the blank 33 are countersunk and the metal between the holes 41 of each pair of holes is slitted as shown at 43 to provide the tabs 18 and elongate openings 16. The blank 33 is also slit between the apertures 36 and 38 longitudinally of the strip 30 to divide the blank into the two leaf members 11 and 12 but at this point in the cycle of operations the leaf members remain attached to the next succeeding blank of the strip. With the two leaf members 11 and 12 thus defined, they are provided with the ears 19 and 25, respectively.

The strip 30 is next advanced to locate the first blank 33 at position D and at this juncture the tabs 18 and the ears 19 of the leaf member 11 are folded upwardly at substantially right angles to the plane of the member as shown best in Fig. 5 to partially form the crossbars 20.

After the strip has again been moved to dispose the first blank 33 at position E, the tabs 18 and the ears 19 are curled around toward each other in semicircular form and as their

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ends about as shown in Fig. 6 the tubular crossbars 20 of true circular cross section are provided. At the same time, the crossbars 20 are forced upwardly a distance equal to the thickness of the metal.

After the strip 30 has been advanced to locate the first blank 33 at position F, the leaf member 12 of the blank 33 is severed from the remainder of the strip 30 along the boundary line 31 between the first and second blanks of the series and, since this member was previously parted from its companion member 11, it is free to be moved laterally relative to the leaf member 11. As the leaf member 12 is forced laterally toward the leaf member 11 suitable forming dies (not shown) act to curl the ears 25 of the member 12 upwardly through the openings 16 of the member 11 and back toward the body portion of the member 12 to provide the arcuate bearing loops 26 which encircle the tubular crossbars 20 with a relatively close but freely rotatable fit.

With the two leaf members 11 and 12 thus hingedly connected, the strip 30 is finally advanced to locate the first blank 33 at the position indicated at G and at this stage in the operation the portion of the blank which forms the leaf member 11 is severed along the boundary line 31 between the first and second blanks to part this member from the remainder of the strip 30 and to detach the finished hinge 10 from the strip.

Each of the several steps (A to G) of my method is preferably carried out on successive portions of the strip 30 in the sequence explained above to effect substantially continuous production of the hinges 10. Since the two parts of the hinge are not only fabricated but assembled during this process, the complete hinges are adapted to be produced in large quantities in a short period of time and thus the manufacturing cost of the articles is reduced to a minimum. It will be apparent to one skilled in the art of fabricating sheet metal articles that the several steps of my method may be carried out automatically in a machine having multiple stamping, perforating and forming dies. While the two companion leaves of my improved hinge have been described as particularly adapted for simultaneous fabrication from a single, substantially continuous strip of material, it is within the concept of this invention to make these parts either from a single sheet or from a pair of substantially continuous strips, the particular shape of the hinge to be produced being an important factor in determining the form of the metal stock to be employed.

While I have herein shown the improved hinge as embodied in a preferred form of construction and disclosed a preferred method of producing the same, by way of example, it will be understood that the construction of the hinge and the manufacturing process may be modified in various particulars without departing from the spirit of the invention. Consequently, I do not desire to be limited by the foregoing specification, but desire to be afforded the full scope of the appended claims.

I claim as my invention:

1. A method of making flap hinges from a substantially continuous strip of material, consisting in: piercing a portion of said strip at spaced points longitudinally of said strip to partially form a pair of longitudinally spaced rectangular apertures while said portion is located at a first position; the material bounded by the edges of said strip and lines drawn transversely of said

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strip through said apertures constituting a hinge blank having a reduced portion between said apertures, advancing said strip to locate said blank in a second position, completing the formation of said rectangular apertures and punching a pair of longitudinally spaced holes in said blank adjacent said reduced portion while said blank is in said second position, advancing said strip to locate said blank in a third position and thereafter slitting the material between said holes tangentially thereof to provide a substantially rectangular tab and severing said blank longitudinally of said strip between said apertures to divide said blank into a first and a second leaf member each having an ear formed by said reduced portion and disposed in the plane of said blank, said tab being disposed on said first leaf member, advancing said strip to locate said blank in a fourth position and thereafter bending said tab and said ear of said first leaf member substantially normal to the plane thereof to provide a substantially rectangular opening adjacent said tab, advancing said strip to locate said blank in a fifth position and thereafter simultaneously curling said tab and said ear of said first leaf member together to provide a tubular crossbar disposed above the plane of said blank, advancing said strip to locate said blank in a sixth position and thereafter parting said second leaf member from said strip, moving said second leaf member laterally toward said first leaf member in a manner to cause its ear to pass under said crossbar and curling said ear of said second leaf member through said opening and around said crossbar to pivotally connect said first and second leaf members, advancing said strip and said second leaf member parted therefrom, but secured thereto by means of said first leaf member, to a seventh position and thereafter parting said first leaf member from said strip to complete the formation of said flap hinge, and successively advancing and acting upon succeeding blank portions of said strip in a like manner to continuously produce flap hinges.

2. A method as set forth in claim 1 and including the steps of punching a plurality of attachment holes in said blank while said blank is in said second position, and countersinking said attachment holes while said blank is in said third position.

3. A method of making flap hinges from a substantially continuous strip of material, consisting in: piercing a portion of said strip at spaced points longitudinally of said strip while said strip is located at a first position to partially form three longitudinally spaced rectangular apertures, the material bounded by the edges of said strip and lines drawn transversely of said strip through alternate apertures constituting a hinge blank having transverse connecting portions between said apertures, advancing said strip to dispose said blank in a second position and thereafter completing the formation of said rectangular apertures, punching a pair of longitudinally spaced holes in said blank adjacent each of said connecting portions while said blank is in said second position, advancing said strip to locate said blank at a third position and thereafter slitting the material between said holes of each pair of holes tangentially thereof to provide a pair of substantially rectangular tabs and severing said connecting portions of said blank longitudinally of said strip between said apertures to divide said blank into a first and a second leaf member

each connected to said strip and each having a pair of ears formed by said severed connecting portions and disposed in the plane of said blank, said pair of tabs being disposed on said first leaf member, advancing said strip to locate said blank at a fourth position and thereafter bending said tabs and said ears of said first leaf member substantially normal to the plane thereof to provide a substantially rectangular opening adjacent each of said tabs, advancing said strip to locate said blank at a fifth position and thereafter simultaneously curling adjacent tabs and ears of said first leaf member together to provide a pair of tubular crossbars disposed above the plane of said first leaf member, advancing said strip to locate said blank at a sixth position and thereafter parting said second leaf member from said strip, and moving said second leaf member laterally toward said first leaf member in a manner to cause its ears to pass under said crossbars and curling said ears of said second leaf member through said openings and around said crossbars to pivotally connect said first and second leaf members, advancing said strip to locate said blank at a seventh position and thereafter parting said first leaf member from said strip to complete the formation of said flap hinge, and successively advancing and acting upon succeeding blank portions of said strip in a like manner to continuously produce flap hinges.

4. A method of making flap hinges from a substantially continuous strip of material, consisting in: piercing a portion of said strip at spaced points longitudinally of said strip while said strip is located at a first position to partially form a plurality of longitudinally spaced apertures, the material bounded by the edges of said strip and lines drawn transversely of said strip through certain of said apertures constituting a hinge blank having transverse connecting portions between said apertures, advancing said strip to dispose said blank in a second position and thereafter completing the formation of said apertures, punching a pair of longitudinally spaced holes in said blank adjacent each of said connecting portions while said blank is in said second position, advancing said strip to locate said blank at a third position and thereafter slitting the material between said holes of each pair of holes tangentially thereof to provide a plurality of substantially rectangular tabs and severing said connecting portions of said blank longitudinally of said strip between said apertures to divide said blank into a first and a second leaf member each having a plurality of ears disposed in the plane of said blank and formed by said severed connecting portions, said plurality of tabs being disposed on said first leaf member, advancing said strip to locate said blank at a fourth position and thereafter bending said tabs and said ears of said first leaf member substantially normal to the plane thereof to provide a substantially rectangular opening adjacent each of said tabs, advancing said strip to locate said blank at a fifth position and thereafter curling adjacent tabs and ears of said first leaf member together to provide a plurality of tubular crossbars disposed above the plane of said blank, advancing said strip to locate said blank at a sixth position and thereafter parting said second leaf member from said strip, moving said second leaf member laterally toward said first leaf member in a manner to cause its ears to pass under said crossbars and

through said openings and curling said ears of said second leaf member around said crossbars to pivotally connect said first and second leaf members, advancing said strip to locate said blank at a seventh position and thereafter parting said first leaf member from said strip to complete the formation of said flap hinge, and successively advancing and acting upon succeeding blank portions of said strip in a like manner to continuously produce flap hinges.

5. A method of making flap hinges from a substantially continuous strip of material, consisting in: piercing a portion of said strip at spaced points longitudinally of said strip to partially form a pair of longitudinally spaced rectangular apertures while said portion is located at a first position, the material bounded by the edges of said strip and lines drawn transversely of said strip through said apertures constituting a hinge blank having a reduced portion between said apertures, advancing said strip to locate said blank in a second position, completing the formation of said rectangular apertures and punching a pair of longitudinally spaced holes in said blank adjacent said reduced portion while said blank is in said second position, advancing said strip to locate said blank in a third position and thereafter slitting the material between said holes tangentially thereof to provide a substantially rectangular tab and severing said blank longitudinally of said strip between said apertures to divide said blank into a first and a second leaf member each having an ear formed by said reduced portion, the line of severance being beyond the ultimate edge of said first leaf member, said tab being disposed on said first leaf member, advancing said strip to locate said blank in a fourth position and thereafter bending said tab and said ear of said first leaf member substantially normal to the plane thereof to provide a substantially rectangular opening adjacent said tab, advancing said strip to locate said blank in a fifth position and thereafter simultaneously curling said tab and said ear of said first leaf member together to provide a tubular crossbar disposed above the plane of said blank, advancing said strip to locate said blank in a sixth position and thereafter parting said second leaf member from said strip, moving said second leaf member laterally toward said first leaf member in a manner to cause its ear to pass under said crossbar and curling said ear of said second leaf member through said opening and around said crossbar to pivotally connect said first and second leaf members, advancing said strip and said second leaf member parted therefrom to a seventh position and thereafter parting said first leaf member from said strip to complete the formation of said flap hinge, and successively advancing and acting upon succeeding blank portions of said strip in a like manner to continuously produce flap hinges.

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