

- 1 -

SWIVEL SNAP HOOK OF SYNTHETIC RESIN
AND METHOD OF MANUFACTURING THE SAME

The present invention relates to a swivel snap hook of synthetic resin for use on a carrying strap of a bag, for example. The invention also relates to a method of manufacturing such a swivel snap hook.

5 There are now on the market various swivel snap hooks of synthetic resin, or metal, for use on a carrying strap of a bag such as a shoulder bag. The prior hooks have a hook body and a separate closure tongue which normally closes the hook body and which is
10 resiliently deformable to open the hook body. However, the known hook is disadvantageous in that the hook body and the closure tongue need to be joined or assembled together after these two parts have been made of
independently of each other, causing only a limited
15 rate of production and hence resulting in expensive products.

To this end, a solution has been proposed by Japanese Utility Model Laid-Open Publication (Kokai) 58-99511 in which the hook body and the closure tongue

are formed of synthetic resin integrally with each other. In production, the hook body and the closure tongue are molded simultaneously on a common mold in such a manner that a free end of the closure tongue is initially disposed outwardly of a free end of the hook body with a relatively small gap therebetween. Then the closure tongue needs to be depressed inwardly of the hook body against the resilience of the closure tongue to bring its free end into engagement with the free end of the hook body on an inner side thereof, which is laborious and time-consuming. A common problem with the resultant hook is that since the free end of the closure tongue is outwardly urged against the free end of the hook body by a great amount of resilient force stored in the closure tongue, a greater amount of pushing force is required to bend the closure tongue inwardly when a ring-shaped article is to be threaded onto and removed from the hook body. Further, if the free end of the hook body is outwardly deformed as a heavy weight or a great amount of pulling force is exerted on the hook body, the free end of the closure tongue would be out of engagement with the free end of the hook body and hence would restore its original shape (before assembling) under its own resilience.

According to a first aspect of the present invention there is provided a swivel snap hook of synthetic resin, comprising a unitary eye member and a unitary hook member each molded of synthetic resin;

said hook member comprising a first base, a hook body and a closure tongue each extending from said first base in a first direction, relative to said first base, and a bearing portion extending from said first base in an opposite second direction relative to said first base;

the closure tongue being formed so that in free form it overlaps and is disposed inwardly of a free end portion of said hook body with a relatively small gap between adjacent sides of the closure tongue and the hook body to substantially close the hook body, the closure tongue being resiliently deformable to open said hook body;

the bearing portion being divided into a pair of mutually opposed bearing halves by a space therebetween, said bearing halves having a pair of mutually aligned through-holes of circular cross-section communicating with said space;

said eye member comprising a second base, a ring-shaped portion extending from said second base in a third direction relative to said second base and an arm portion extending from said second base in a fourth direction opposite to said third direction;

said arm portion terminating in an enlarged end which is loosely received in said through-holes in said bearing holes in said bearing halves across said space for rocking movements.

According to a second aspect of the present invention there is provided a swivel snap hook of synthetic resin, comprising:

(a) an eye member;

(b) a unitary hook member pivotally connected to said eye member, said hook member having a base, a hook body extending from one side of said base, and a closure tongue extending from the opposite side of said base so as to normally substantially close said hook body and being resiliently deformable to open said hook body, said closure tongue having a free end portion which, as said closure tongue is in free form, overlaps and is disposed inwardly of a free end portion of said hook body with a relatively small gap between the sides thereof, said free end of said closure tongue being inwardly bent;

(c) said hook body including a substantially straight stem portion projecting perpendicularly from said base, and a hook-shaped portion extending substantially perpendicularly from a lower end of said stem portion and terminating in a free end portion, said hook body having a projection extending inwardly from said stem portion and disposed slightly below the bent tip of said free end portion of said closure tongue so as not to interfere therewith when said closure

tongue is inwardly depressed; and

(d) said projection having a concave under-surface as an extension of an arcuate inner surface of said hook-shaped portion, said hook-shaped portion having on its inner surface a reinforcement rib having a concave surface as an extension of the arcuate inner surface of said hook-shaped portion, said concave under-surface of said projection and said concave surface of said reinforcement rib being a pair of diametrically opposed parts of the circumference of a circle having a radius (r).

According to a third aspect of the present invention there is provided a method of manufacturing a swivel snap hook of synthetic resin, the hook including an eye member and a hook member pivotally connected thereto, the hook member having a base, a hook body extending from one side of the base, and a resiliently deformable closure tongue extending from the one side of the base so as to normally close the hook body, said method comprising:

(a) providing a mold defining a mold cavity of a contour corresponding to the shape of the eye and hook members in coupled state, said mold including a pair of identical molding die halves and a pair of identical associated molding rods, said pair of molding die halves having a pair of symmetrical first eye-member recesses for forming a part of the eye member, a pair of symmetrical first base recesses for forming a part of the base of the

hook member, a pair of symmetrical hook-body recesses for forming the hook body, a pair of symmetrical closure-tongue recesses for forming the closure tongue, and a pair of symmetrical additional recesses for receiving said associated molding rods in confronting relation, said pair of associated molding rods having in their confronting ends a pair of symmetrical second eye-member recesses for forming the remaining part of the eye member and a pair of symmetrical second base recesses for forming the remaining part of the hook member, said closure-tongue recess in each said molding die half having a free end portion overlapping and spaced inwardly from a free end portion of said hook-body recess with a relatively small gap between the sides thereof;

(b) closing said mold in such a manner that said first eye-member recess, said first base recess, said hook-body recess, said closure-tongue recess and said additional recesses in one molding die half are in registry with the corresponding recesses in the other molding die half, said closing including inserting each of said associated molding rods into said additional recesses halfway in such a manner that said pair of associated molding rods abut each other on their confronting ends;

(c) injecting an amount of heat-softened thermoplastic synthetic resin into the closed mold to fill the mold cavity therein; and

(d) after the heat-softened thermoplastic synthetic resin in the mold cavity is cooled to become hard enough, removing from the mold the eye and hook member molded in coupled state.

associated molding rods into said additional recesses halfway in such a manner that said pair of associated molding rods abut each other on their confronting ends;

(c) injecting an amount of heat-softened thermoplastic synthetic resin into the closed mold to fill the mold cavity therein; and

(d) after the heat-softened thermoplastic synthetic resin in the mold cavity is cooled to become hard enough, removing from the mold the eye and hook member molded in coupled state.

5 It is believed possible by means of the present invention to provide a swivel snap hook of synthetic resin which can be produced in a reduced number of manufacturing steps, thus requiring no additional step of bringing a free end portion of the closure tongue inwardly of a free end portion of the hook body after the hook has been molded.

10 It is further believed possible by means of the present invention to provide a swivel snap of synthetic resin in which a closure tongue can be depressed easily with minimum pushing force.

15 It is still further believed possible by means of the invention to provide a swivel snap hook of synthetic resin in which a closure tongue is free from being displaced outwardly of a free end portion of a hook body even when a heavy weight or a great amount of pulling force is exerted on the hook body.

20 It is further believed possible by means of the present invention to provide a method of manufacturing the above-mentioned swivel snap hook.

The invention will be described by way of example with reference to the accompanying drawings, wherein:-

Figure 1 is a front elevational view of a swivel snap hook of synthetic resin embodying the present invention;

Figure 2 is a side elevational view of Figure 1;

Figure 3 is a cross-sectional view taken along line III-III
5 of Figure 2;

Figure 4 is a side elevational view similar to a Figure 2, with parts broken away, illustrating a connection between an eye member and a hook member;

Figure 5 is a fragmentary exploded view of a mold for molding
10 the hook of Figures 1 - 4;

Figure 6 is a cross-sectional view taken along line VI-VI of Figure 5;

Figure 7 is a front elevational view of a modified swivel snap hook;

15 Figure 8 is a side elevational view of Figure 7; and

Figure 9 is a cross-sectional view taken along line IX-IX of Figure 8.

In the drawings, like references refer to like parts unless stated otherwise.

20 Figures 1 through 4 show a swivel snap hook which comprises an eye member 1 adapted to be attached to one end of a carrying strap (not shown) of a bag such as a shoulder bag, and a hook member 2 rotatably

and rockably connected to the eye member 1. The eye and hook members 1, 2 are molded of synthetic resin in a manner described below.

The hook member 2 has a first base 10, a hook
5 body 12 extending downwardly from one side of the first base 10, and a planar closure tongue 13 extending downwardly from the opposite of the first base 10 so as to normally close the hook body 12 in a manner described below. The hook member 2 also has an
10 integral bearing portion which extends upwardly from the first base 10 and which is divided into a pair of opposed bearing halves 11, 11 by a space 15. The pair of opposed bearing halves 11, 11 have a pair of aligned through-holes 16, 16 of circular cross
15 section communicating with the space 15.

The eye member 1 has a second base 20, a ring-shaped portion 21 extending upwardly from the second base 20, and an integral arm portion 22 extending downwardly from the second base 20 remotely
20 from the ring-shaped portion 21 into the space 15 and terminating in an enlarged end 23 loosely received in the through-holes 16, 16 in the bearing halves 11, 11 across the space 15.

The arm portion 22 has a circular cross section
25 of a diameter slightly smaller than the width of the space 15 (Figure 2 and 4), while the enlarged end 23 of the arm portion 22 is in the shape of a remainder of a

sphere in which an upper segmental part has been cut off by a plane perpendicular to the axis 3 of the arm portion 22. The diameter of this sphere is larger than the width of the space 15 and is substantially equal to the diameter of the through-holes 16, 16. Thus the hook member 2 is rotatable and rockable on the eye member 1 and vice versa. Specifically, the hook member 2 is rotatable on the eye member 1 about the axis 3 of the arm portion 22 and is pivotally movable on the eye member 1 about the spherical enlarged end 23 in a plane which includes the axis 3 of the bearing portion and which is parallel to the bearing halves 11, 11.

The hook body 12 has a substantially straight stem portion 12A projecting perpendicularly from the base 10, and a hook-shaped portion 12B extending laterally from a lower end of the stem portion 12A and terminating in an upwardly directed free end 18. The hook-shaped portion 12B has on its inner curved surface adjacent to the free end 18 a reinforcing rib 17 which serves to prevent the hook-shaped portion 12B from being objectionably deformed due to undue stress exerted thereon.

As shown in Figures 1 and 3, the closure tongue 13 extends downwardly from the base 10 in parallel relation to the stem portion 12A of the hook body 12 and terminates in a free end portion 19 which, as the closure tongue 13 is in free form overlaps, and is disposed inwardly of, the

free end portion 18 of the hook body 12 with a (relatively) small gap 14 between the sides thereof, see the drawings. In use, as the closure tongue 13 is depressed inwardly against its resilience by a ring-shaped article (not shown) to be threaded onto the hook body 12, the free end portion 19 of the closure tongue 13 is spaced wider from the free end portion 18 of the hook-shaped portion 12B to open the hook body 12 so that the article is allowed to be threaded onto the hook body 12. When the depressing force is released, the closure tongue 13 is restored to the shape of Figures 1 and 3 under its resilience to close the hook body 12, thus preventing the article from being removed from the hook body 12.

In production, the eye member 1 and the hook member 2 are molded on a mold simultaneously in a single molding step in coupled or assembled state. As shown in Figures 5 and 6, the mold includes a pair of identical molding die halves 30, 30, and a pair of identical associated molding rods 31, 31. The two molding die halves 30, 30 and the two associated molding rods 31, 31, when the mold is closed, jointly define a mold cavity having a contour corresponding to the shape of eye and hook members 1, 2 in coupled state.

The two molding die halves 30, 30 have a pair of symmetrical first recesses 21a, 21a for forming the ring-shaped portion 21a of the eye member 1 (of a

prospective swivel snap hook), a pair of symmetrical second recesses 20a, 20a for forming a part of the base 20 of the eye member 1, a pair of symmetrical third recesses 11a, 11a for forming parts of the bearing halves 11, 11 a pair of symmetrical fourth recesses 10a, 10a for forming a part of the second base 10 of the hook member 2, a pair of symmetrical fifth recesses 12a, 12a for forming the hook body 12, a pair of symmetrical sixth recesses 13a, 13a for forming the closure tongue 13, and a pair of symmetrical seventh recesses 23a, 23a for forming parts of the spherical enlarged end 23 of the arm portion 22. As shown in Figure 5, in each molding half 30, the sixth recess 13a for the closure tongue 13 extends downwardly from the fourth recess 10a for the second base 10 and terminates in a free end 19a disposed adjacent to and overlapping an upwardly directed free end 18a of the fifth recess 12a for the hook body 12 and spaced inwardly therefrom by a (relatively) small distance 14a corresponding to the gap 14 (Figures 1 and 3).

The pair of the associated molding rods 31 have in their confronting ends a pair of symmetrical eighth recesses 20b, 20b for forming the remaining part of the first base 20 of the eye member 1, a pair of symmetrical ninth recesses 22b, 22b for forming the arm portion 22, a pair of symmetrical tenth recesses 23b, 23b for forming the remaining part of the spherical

enlarged end 23 of the arm portion 22, a pair of symmetrical eleventh recesses 10b, 10b for forming the remaining part of the second base 10 of the hook member 2, and two pairs of symmetrical twelfth recesses 11b, 11b; 11b, 11b for forming the remaining parts of the bearing halves 11, 11 of the hook member 1.

Additionally, the two molding die halves 30, 30 have a pair of symmetrical thirteenth recesses 31a, 31a for jointly receiving the two associated molding rods 31, 31 during molding.

In molding, the mold is closed, namely, the two molding die halves 30, 30 are put together in such a manner that the first, second, third, fourth, fifth, sixth, seventh and thirteenth recesses 21a, 20a, 11a, 10a, 12a, 13a, 23a, 31a in one molding die half 30 are in registry with the corresponding recesses in the other molding die half 30. Each associated molding rod 31 is inserted into the pair of symmetrical thirteenth recesses 31a, 31a halfway in such a manner that the two associated molding rods 31, 31 abut each other on their confronting ends at the center line 3a (Figure 5) of the second, third, fourth and seventh recesses 20a, 11a, 10a, 23a. An amount of heat-softened thermoplastic synthetic resin is then injected through a sprue 32 (Figure 5) into the closed mold to fill the mold cavity thereof. After the thermoplastic material filled in the mold cavity is cooled to become hard

enough, the molded article (a prospective swivel snap hook) is removed from the mold by parting the molding die halves 30, 30 and the associated molding rods 31, 31, as is well known in the art.

5 As a result, the eye member 1 and the hook member 2 have been molded simultaneously in coupled or assembled state, at which time the free end portion 19 of the freshly molded closure tongue 13 overlaps, and is disposed inwardly of, the free end portion 18 of the freshly molded hook body 12
10 with a (relatively) small gap 14a therebetween. Accordingly it is possible to obtain the final product, i.e. the swivel snap hook of Figures 1 - 4 in only a single molding step with no additional step of bringing the free end portion 19 of the closure tongue 13 inwardly of
15 the free end portion 18 of the hook body 12 after the hook has been molded. The overall process for manufacturing this swivel snap hook is quite simplified and hence much less costly.

 Figures 7 through 9 illustrate a modified swivel
20 snap hook which is similar to the swivel snap hook of Figures 1 - 4, except that the tip of the free end portion 19 of the closure tongue 13 is bent inwardly, i.e. toward the stem portion 12A of the hook body 12 and that the hook body 12 has a projection 30 extending inwardly (toward
25 the closure tongue 13) from the stem portion 12A. The projection 30 is disposed slightly below the bent tip of the free end portion 19 of the closure tongue 13 so as not to interfere

therewith when the closure tongue 13 is depressed to assume the phantom-line position of Figure 7.

The projection 30 has a concave under-surface 30a as an extension of an arcuate inner surface of the hook-shaped portion 12B, and the reinforcement rib 17 also has a concave surface 17a as an extension of the arcuate inner surface of the hook-shaped portion 12B. These two concave surfaces 30a, 17a are a pair of diametrically opposed parts of the circumference of a circle having a radius r . The bent tip of the free end portion 19 of the closure tongue 13, as the latter is in free form, is horizontally (in Figures 7 and 9) spaced apart from the projection 30 by a distance $L1$ substantially equal to the radius r . The projection 30 has a height $L2$ equal to the distance $L3$ between an outer surface of the closure tongue 13 and the bent tip of the free end portion 19. The reinforcement rib 17 is in the shape of a generally equilateral triangle having an apex in which the concave surface 17a terminates; this apex is horizontally (Figures 7 and 9) spaced apart from the tip of the projection 30 by a distance $L4$ slightly larger than the radius r .

The inwardly bent tip of the free end portion 19 of the closure tongue 13 and the projection 30 of the hook body 2 jointly serve to restrict upward movement of a ring-shaped article (not shown) threaded onto the hook-shaped portion 12c. Since the tip of the free end portion 19 of the closure

tongue 13 is inwardly bent, the amount of deformation of the closure tongue 13 is reduced so that the closure tongue 13 is prevented from being excessively depressed and hence broken particularly at its foot portion about 5 which the closure tongue 13 is angularly moved when the ring-shaped article is threaded onto and removed from the hook body 12.

Further, when the closure tongue 13 is fully depressed, its outer surface is flush with the tip of 10 the projection 30 of the hook body 12, thus causing smooth threading and removal of the ring-shaped article. The concave under-surface 30a of the projection 30 extends as an extension of the arcuate inner surface of the hook-shaped portion 12c and hence 15 serves as a guide to assist in removing the ring-shaped article from the hook-shaped portion 12c.

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CLAIMS

1. A swivel snap hook of synthetic resin, comprising a unitary eye member and a unitary hook member each molded of synthetic resin;

said hook member comprising a first base, a hook body and a closure tongue each extending from said first base in a first direction, relative to said first base, and a bearing portion extending from said first base in an opposite second direction relative to said first base;

the closure tongue being formed so that in free form it overlaps and is disposed inwardly of a free end portion of said hook body with a relatively small gap between adjacent sides of the closure tongue and the hook body to substantially close the hook body, the closure tongue being resiliently deformable to open said hook body;

the bearing portion being divided into a pair of mutually opposed bearing halves by a space therebetween, said bearing halves having a pair of mutually aligned through-holes of circular cross-section communicating with said space;

said eye member comprising a second base, a ring-shaped portion extending from said second base in a third direction relative to said second base and an arm portion extending from said second base in a fourth direction opposite to said third direction;

said arm portion terminating in an enlarged end which is loosely received in said through-holes in said bearing holes in said bearing halves across said space for rocking movements.



2. A swivel snap hook according to claim 1, said closure tongue being, in its free form, parallel to the general plane of said free end portion of said hook body.

3. A swivel snap hook according to claim 1, a tip of said free end portion of said closure tongue being inwardly bent.

4. A swivel snap hook according to claim 3, said hook body including a substantially straight stem portion projecting perpendicularly from said base, and a hook-shaped portion extending substantially perpendicularly from a distal end of said stem portion and terminating in said free end portion, said hook body having a projection extending inwardly from said stem portion and disposed slightly beyond the bent tip of said free end portion of said closure tongue so as not to interfere therewith when said closure tongue is inwardly depressed.

5. A swivel snap hook according to claim 4, said projection having a concave under-surface as an extension of an arcuate inner surface of said hook-shaped portion, said hook-shaped portion having on its inner surface a reinforcement rib having a concave surface as an extension of the arcuate inner surface of said hook-shaped portion, said concave under-surface of said projection and said concave surface of said reinforcement rib being a pair of



diametrically opposed parts of the circumference of a circle having a radius (r).

6. A swivel snap hook according to claim 5, the bent tip of said free end portion of said closure tongue, as the latter is in free form, being spaced apart from said projection by a distance (L1) substantially equal to said radius (r).

7. A swivel snap hook according to claim 5, said projection having a height (L2) equal to a distance (L3) between an outer surface of said closure tongue and the tip of said free end portion.

8. A swivel snap hook according to claim 5, said reinforcement rib being in the shape of a generally equilateral triangle having an apex in which said last-named concave surface terminates, said apex being spaced apart from a tip of said projection by a distance (L4) slightly larger than said radius (r).

9. A swivel snap hook of synthetic resin, comprising:

(a) an eye member;

(b) a unitary hook member pivotally connected to said eye member, said hook member having a base, a hook body extending from one side of said base, and a closure tongue extending from the opposite side of said base so as to normally substantially close said hook body and being resiliently deformable to open said hook body, said closure tongue having a free end portion which, as said closure tongue is in free form, overlaps and is disposed inwardly of a free end portion of said



hook body with a relatively small gap between the sides thereof, said free end of said closure tongue being inwardly bent;

(c) said hook body including a substantially straight stem portion projecting perpendicularly from said base, and a hook-shaped portion extending substantially perpendicularly from a lower end of said stem portion and terminating in said free end portion, said hook body having a projection extending inwardly from said stem portion and disposed slightly below the bent tip of said free end portion of said closure tongue so as not to interfere therewith when said closure tongue is inwardly depressed; and

(d) said projection having a concave under-surface as an extension of an arcuate inner surface of said hook-shaped portion, said hook-shaped portion having on its inner surface a reinforcement rib having a concave surface as an extension of the arcuate inner surface of said hook-shaped portion, said concave under-surface of said projection and said concave surface of said reinforcement rib being a pair of diametrically opposed parts of the circumference of a circle having a radius (r).

10. A method of manufacturing a swivel snap hook of synthetic resin, the hook including an eye member and a hook member pivotally connected thereto, the hook member having a base, a hook body extending from one side of the base, and a resiliently deformable closure tongue extending from the one side of the base so as to normally close the hook body, said method comprising:



(a) providing a mold defining a mold cavity of a contour corresponding to the shape of the eye and hook members in coupled state, said mold including a pair of identical molding die halves and a pair of identical associated molding rods, said pair of molding die halves having a pair of symmetrical first eye-member recesses for forming a part of the eye member, a pair of symmetrical first base recesses for forming a part of the base of the hook member, a pair of symmetrical hook-body recesses for forming the hook body, a pair of symmetrical closure-tongue recesses for forming the closure tongue, and a pair of symmetrical additional recesses for receiving said associated molding rods in confronting relation, said pair of associated molding rods having at their confronting ends a pair of symmetrical second eye-member recesses for forming the remaining part of the eye member and a pair of symmetrical second base recesses for forming the remaining part of the base of the hook member, said closure-tongue recess in each said molding die half having a free end portion overlapping and spaced inwardly from a free end portion of said hook-body recess with a relatively small gap between the sides thereof;

(b) closing said mold in such a manner that said first eye-member recess, said first base recess, said hook-body recess, said closure-tongue recess and said additional recesses in one molding die half are in registry with the corresponding recesses in the other molding die half, said closing including inserting each of said



- 20 -

associated molding rods into said additional recesses halfway in such a manner that said pair of associated molding rods abut each other on their confronting ends;

(c) injecting an amount of heat-softened thermoplastic synthetic resin into the closed mold to fill the mold cavity therein; and

(d) after the heat-softened thermoplastic synthetic resin in the mold cavity is cooled to become hard enough, removing from the mold the eye and hook member molded in coupled state.
