Dec. 4, 1956 J. P. MURTAUGH 2,772,492

RETAINER PINS FOR DIPPER TEETH

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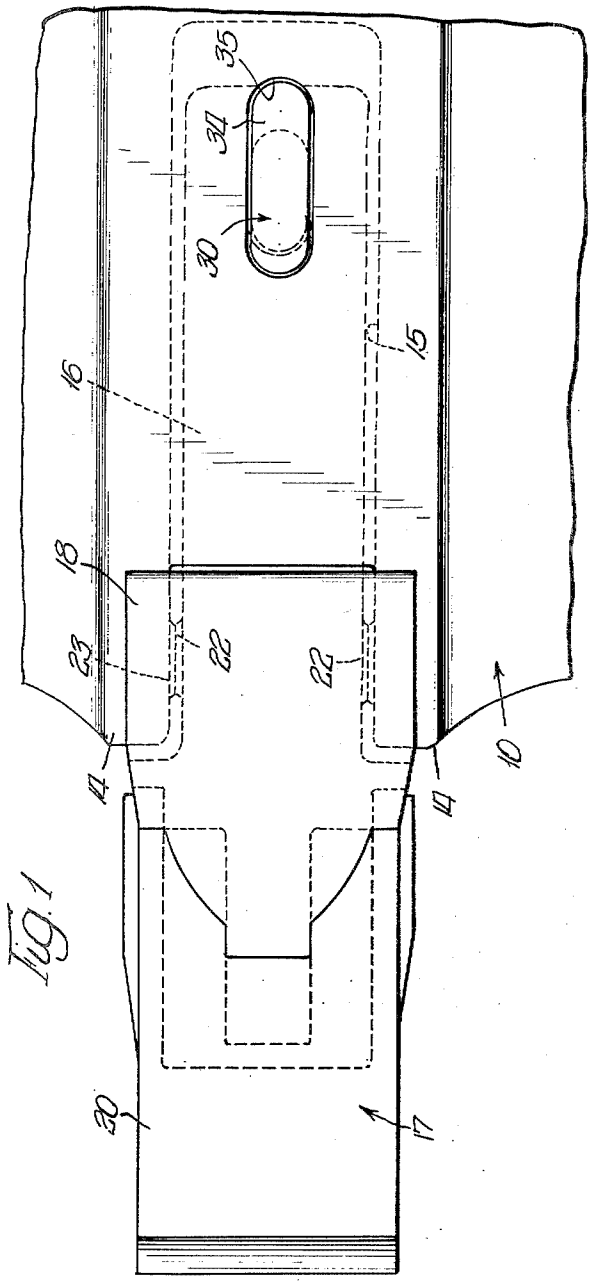


Fig. 1

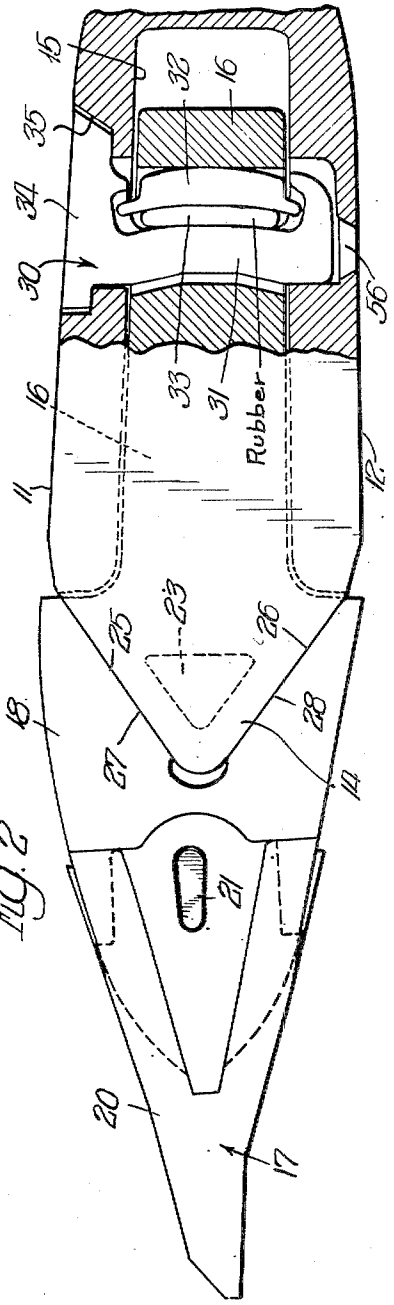


Fig. 2

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Fig. 3

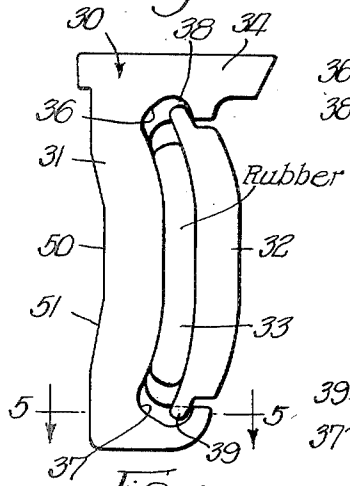


Fig. 4

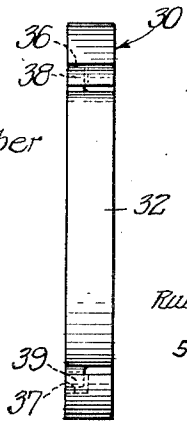


Fig. 6

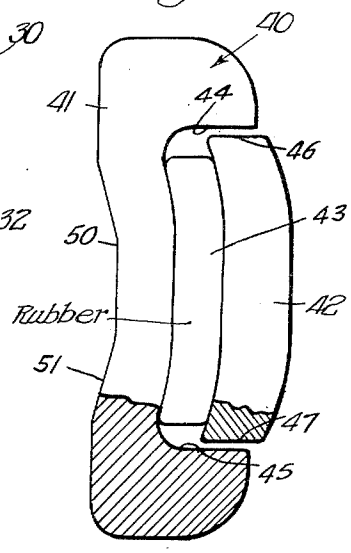


Fig. 7

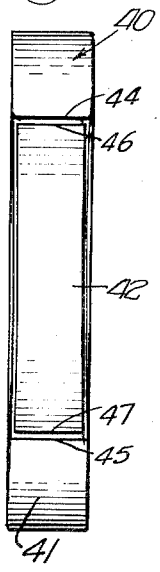


Fig. 5

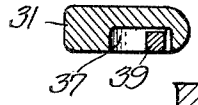
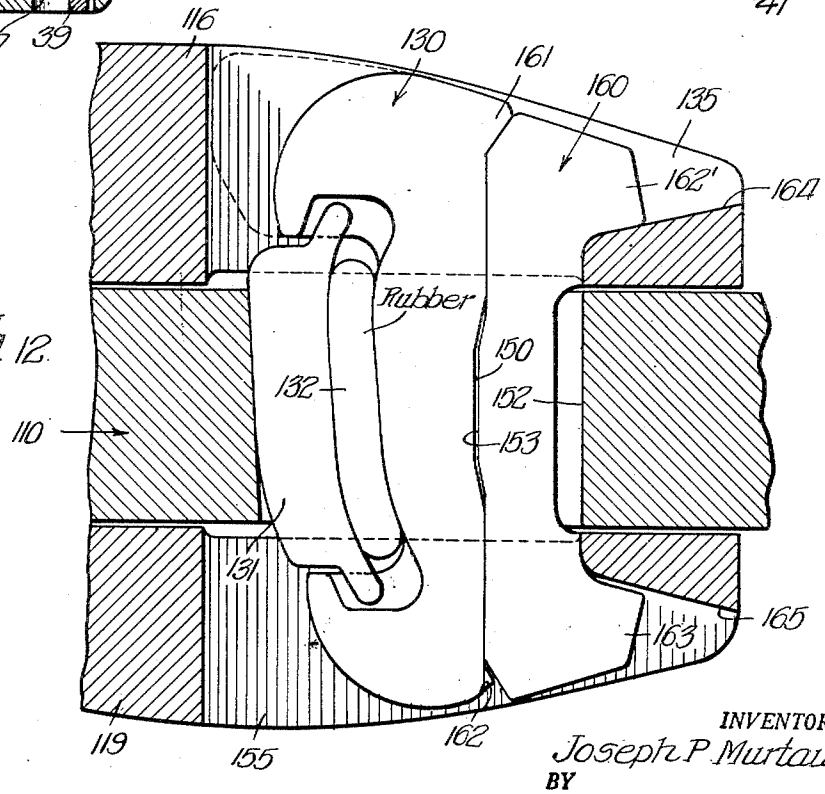


Fig. 12



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Fig. 8

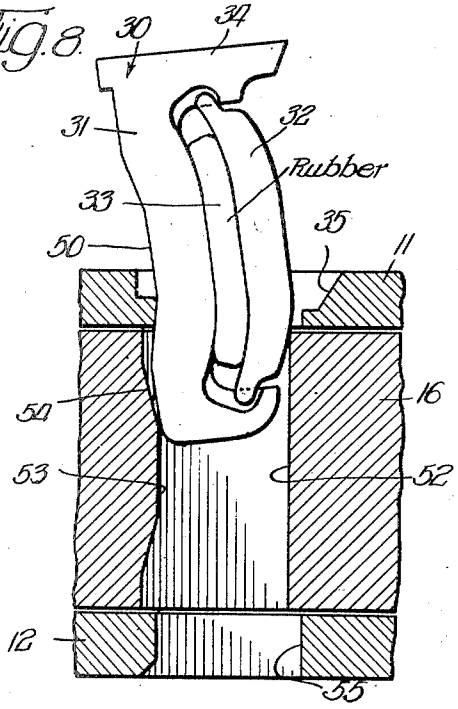


Fig. 9

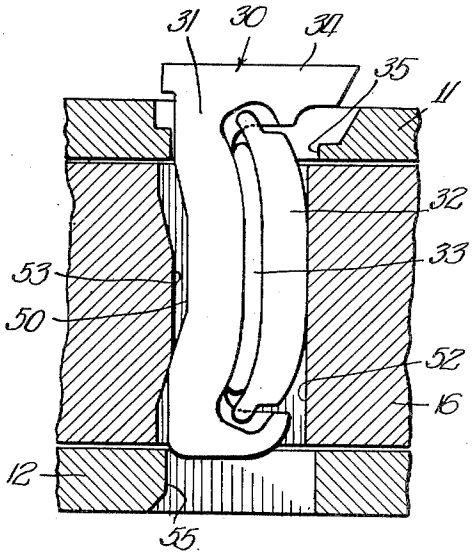


Fig. 10

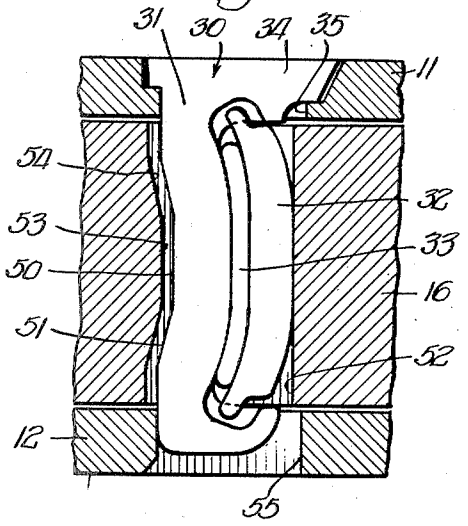
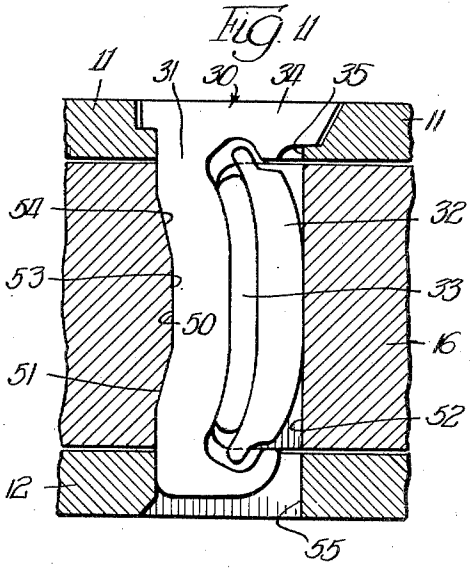


Fig. 11



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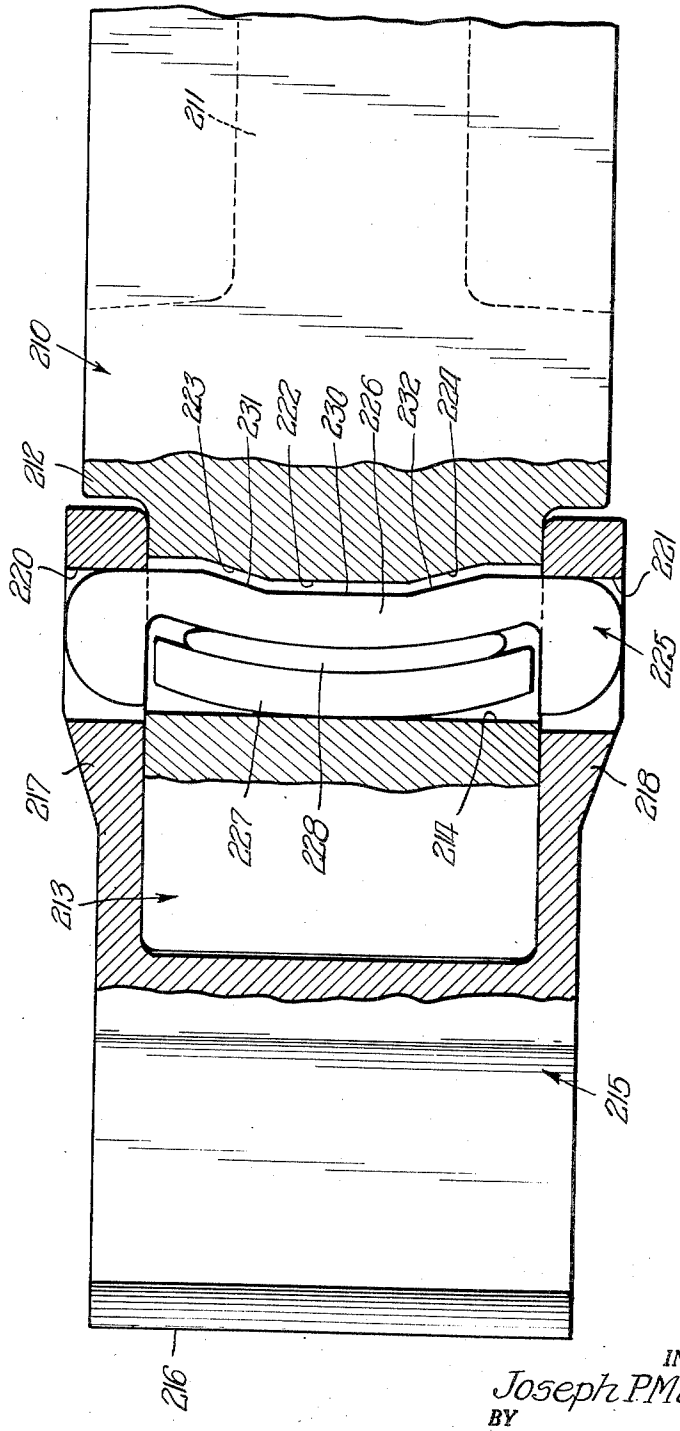


Fig. 13.

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2,772,492

RETAINER PINS FOR DIPPER TEETH

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Application February 12, 1953, Serial No. 336,498

4 Claims. (Cl. 37—142)

The invention relates to replaceable dipper teeth for excavating buckets and the like and has reference in particular to an improved clamp or retaining means for releasably locking a dipper tooth to the lip of an excavating bucket and which will additionally function as the clamp or key for releasably locking a replaceable point or tip to its adapter.

As regards all types of dipper teeth which are attached to the lip of excavating buckets, it is practically impossible to maintain a tight fit between the nose portion of the lip and the adapter of the dipper tooth. One reason for the dipper tooth working loose is of course due to the tremendous stresses and strains to which the tooth is subjected as a result of the digging action of the bucket. Another reason is that the important surfaces are usually not accessible for grinding and are essentially rough castings. Accordingly, after being subjected to impact and pressure the surfaces will wear and peen down rather rapidly, causing looseness to occur between the adapter of the tooth and the bucket lip. If this looseness between the parts is allowed to continue the tooth will prematurely wear out and in some cases such looseness has been the direct cause of tooth breakage.

An object of the invention is to provide an improved dipper tooth construction which will eliminate, on both the adapter and lip, the rough surfaces which interengage with each other by locating said surfaces so that they are exposed and accessible for grinding to thus establish bearing surfaces that are smooth enough to remain reasonably constant during the life of the casting.

A further object of the invention is to provide improved dipper tooth construction which will employ a dipper tooth having a relatively heavy shank for increased strength, in combination with supporting nose portions and a clamping member of unique design for releasably locking the bearing surfaces in tight engagement, one against the other.

The so-called shank type of tooth or adapter is preferred for use on general purpose buckets such as those sold to private operators, contractors, municipalities and the like. On this type of bucket the usual practice is to cast the base connections as an integral part of the dipper front or lip. Therefore, it is necessary to use clamping members which in the past have comprised tapered wedges or keys which extend vertically through aligned openings provided in the lip and shank, respectively. The vertical wedges and keys have been a source of irritation and trouble to shovel operators. Wedges to be effective must have a large amount of take-up, which means that they must extend above and below the dipper lip. Also no method has been devised to keep a tapered wedge in tight engagement since it is constantly in contact with the material being handled on the inside of the dipper and is subjected to rough usage by rocks and such material as may contact the underside of the dipper.

Accordingly, another object of the invention is to provide an improved clamping member or retaining pin for dipper teeth which will be fully enclosed within the top and bottom surfaces of the dipper lip, a clamping member that can not be displaced inwardly beyond the point where it will function efficiently, and a clamping member or retaining pin that can be removed only by using a punch and hammer.

A further object resides in the provision of a clamping member for the purposes described which will embody a resilient rubber pad adapted to be compressed by insertion of the clamping member in openings provided therefor, and which functions during usage to automatically expand and take up looseness such as may be caused to wear at the bearing surfaces.

A more specific object is to provide a unitary clamping member consisting of a metal clamp, a metal wedge, and a rubber pad located between the clamp and wedge and wherein the unitary member has a special shape and configuration, all of which are so designed as to facilitate insertion of the clamping member and which additionally serves to prevent accidental displacement of the member, regardless of the pressure or lack of pressure applied to the rubber pad.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a top plan view, fragmentary in nature, illustrating part of a dipper lip to which has been attached the improved structure of dipper tooth embodying the features of the invention;

Figure 2 is a side elevational view of the lip and dipper tooth shown in Figure 1, with parts being shown in section to better illustrate the locking action of the clamping member;

Figure 3 is a side elevational view showing one preferred form of clamping member;

Figure 4 is a front elevational view of the clamping member shown in Figure 3;

Figure 5 is a sectional view taken substantially along line 5—5 of Figure 3;

Figure 6 is a side elevational view of another preferred form of clamping member;

Figure 7 is a front elevational view of the clamping member shown in Figure 6;

Figure 8 is a fragmentary sectional view illustrating the position of the parts for initially inserting the clamping member into the openings provided therefor;

Figure 9 is a view similar to Figure 8 but showing the clamping member fully compressed and partially inserted in the openings provided therefor;

Figure 10 is a view similar to Figure 9 but showing the clamping member fully inserted in its openings and with the member in compressed relation for exerting pressure to take up any looseness such as may develop between the tooth and the lip of the bucket;

Figure 11 is a view similar to Figure 10 but illustrating an expanded position of the clamping member;

Figure 12 is a fragmentary sectional view illustrating a modified form of clamping structure coming within the invention; and

Figure 13 is a plan view of a replaceable point and adapter, parts being shown in section to better illustrate the use of the present clamping member for releasably locking the point to its adapter.

Referring to the drawings, and particularly to Figures 1 and 2, the invention is shown as applied to the lip **10** of a conventional excavating bucket of the type used with power shovels. The lip has a top surface **11** and a bottom surface **12**. The top surface may be referred to

as the inside surface since it is within or substantially enclosed by the side walls of the bucket. At spaced locations along the front edge of lip **10** the same is provided with nose portions **14—14**, each such pair of nose portions being disposed on the respective sides of an opening or recess such as **15**, extending longitudinally of the lip. The recess **15** is adapted to receive the shank such as **16** of the dipper tooth identified in its entirety by numeral **17**. Said tooth may be of the one or two-part type having a shank member, preferably of the socket type, and which is of a size and length to be received by the recess **15**. In dipper teeth of the one-part type the shank and tooth are integral so that a unitary article is provided and wherein the entire unit is removed when it becomes necessary to replace a worn tooth. In dipper teeth of the two-part type the point comprises a separate element from the adapter which is formed integral with the shank portion. Figures 1 and 2 show a two-part tooth wherein the shank portion **16** is integral with the adapter **18**, the latter providing certain base portions designed to receive the replaceable point **20**. A key or clamping member such as **21** is inserted in the aligned openings provided by the structure and said member retains the point in attached relation on the adapter.

The invention contemplates that the clamping member such as shown in Figures 6 and 7 will find utility in locking replaceable points in assembled relation on their adapters. The openings in the parts for receiving the clamping member and the coaction of the member therewith is the same irrespective of whether the member is adapted to lock a digging tooth to the lip of a digger or lock a replaceable point to its adapter. The structure of replaceable point and adapter as shown in Figures 1 and 2 is disclosed and claimed in application Serial No. 138,238, now Patent No. 2,689,419, filed in the name of Daniels and Murtaugh on January 12, 1950, and entitled "Excavating Bucket Adapters and Teeth."

In the present design of dipper tooth the contacting surfaces between nose portion and adapter are exposed and rendered accessible for grinding. As a result the rough surfaces on the castings can be ground smooth to thus establish bearing surfaces which are compact and smooth so that they remain reasonably constant during the life of the casting. Also in accordance with the invention, the shank portion **16** of the dipper tooth is preferably of the socket type and relatively large in size in order to provide adequate strength to withstand the severe stresses and strains to which the tooth is subjected during digging action of the bucket. The shank portion **16** is adapted to have a relatively close and tight fit within the recess **15** and it will be observed that positioning pads such as **22** are provided on respective sides of the shank portion at its forward end adjacent the adapter portion **18**. The positioning pads **22** are adapted to have their flat surfaces accurately ground to specified dimensions so that the positioning pads will have proper contact with similar positioning pads **23** located on the nose portions **14**, respectively. Each pad **23** is positioned on the inside surface of its respective nose portion adjacent the forward end thereof. With the tooth in place it will be seen that the adapter is held against lateral movement and with the socket type of shank portion having the proper fit within recess **15** the structure is generally adequate for securely mounting the adapter of the dipper tooth on the lip of the bucket. Of course the positioning pads **23**, provided on the inside surfaces of the nose portions, are also ground flat to specified dimensions in order that the proper contact may result with respect to pads **22**.

The present invention seeks to improve the mounting of the adapter on the lip of the bucket by eliminating rough surfaces where the parts are adapted to interengage and thus reduce the wear which necessarily takes place between said surfaces. Accordingly, the nose portions **14—14** are each provided with ground surfaces such as **25** and **26**, the same sloping diagonally in a forward direction to form an angle at the apex of the nose portion. In a similar manner the adapter **18** is provided with complementary surfaces on each side of the adapter, the same being identified by numerals **27** and **28**. In mounting the adapter on the lip of the bucket the surfaces of the nose portions interfit with the adapter so that surfaces **25** and **26** are in contact with surfaces **27** and **28**, respectively. The surfaces are all exposed and accessible for grinding so that they can be ground smooth for a full and accurate contact.

Instead of using tapered wedges or keys which are conventional for locking the shank portion of a tooth to the dipper lip, the invention substitutes therefor an improved clamping member having a novel shape and configuration and a unique mode of operation whereby the clamping member is effective to take up the wear occurring at the bearing contacting surfaces. Also the disadvantages inherent in the use of tapered wedges and keys is entirely eliminated by the present clamping member since the same is wholly confined within the top and bottom surfaces of the dipper lip. This is an important advantage since no obstructions are presented on the top surface such as would interfere with the material within the dipper and the lack of obstructions on the bottom surface permits use of the shovel for digging rocks and similar material.

The improved clamping member of the invention is shown in Figure 1 in fully engaged position for locking adapter **18** and the shank member **16** thereof to the lip **10** of the bucket. Figures 3, 4 and 5 show constructional details of the member. The numeral **30** indicates the clamping member in its entirety, the same consisting of a member **31** generally C-shape in outline, an arcuate wedge **32**, and a pad **33** of rubber or similar resilient material. The C-shaped member **31** is provided with a head portion or top **34** having an elliptical outline and a shape to neatly fit within opening **35** provided therefor in the top surface **11** of the dipper lip. Also said clamp on one side thereof, such as the left side, Figure 4, is provided with a top recess **36** and a bottom recess **37**. The recesses are adapted to receive the projections **38** and **39**, respectively, provided at the top and bottom ends of the wedge **32**. Said projections have a width equal to about one-half that of the wedge and the projections are located adjacent the left side of the wedge, as shown in Figure 4, as a result of which they enter the recesses which accordingly function to retain the wedge in proper position on the clamp. The clamping member is completed by the resilient pad **33** which may comprise a rubber pad, the same having location between the clamp and the wedge.

Figures 6 and 7 disclose another preferred form of clamp member or retaining pin **40** wherein the rubber pad is bonded to the clamp and wedge so that the retaining structure comprising the projections and recesses can be eliminated. The retaining pin essentially consists of the member **41**, which is generally C-shape in outline, having associated therewith the arcuate wedge **42**, with the rubber pad such as **43** being located between the clamp and wedge. As best shown in Figure 7, adjacent surfaces at the top and bottom of the wedge are flat. Accordingly, the inside top and bottom surfaces **44** and **45** of the clamp **41** are flat and parallel to the top and bottom surfaces **46** and **47** of the wedge **42**. Also it will be noted that the wedge is located substantially within the confines of the C-clamp so that upon insertion of the clamping member movement applied to the clamp will be directly transmitted to the wedge.

The retaining pin of the invention has a special shape and configuration in order to facilitate insertion of the member in substantially aligned openings provided therefor in the dipper lip and in the shank of the tooth. As best shown in Figures 3 and 6 the C-shaped member **31** is

provided with a concavity or depression on the exposed surface thereof opposite the wedge. Said concavity is characterized by a flat bottom area 50 and sloping side areas 51. The opening 52 formed in shank 16 of the dipper tooth is provided with surfaces complementary in shape to the concavity characterizing the clamping member. As best shown in Figure 8, the forward surface of the opening 52 of the shank is convex in contour, the same being formed by a flat area 53 and sloping side areas 54.

The locking action of the clamping member is best illustrated in Figures 8 to 11 inclusive. In accordance with the invention the initial positioning of the adapter 18 on the nose portion of the dipper lip is such as to locate opening 52 in forward offset relation with respect to openings 35 and 55, located respectively in the top and bottom surfaces of the lip. It will be observed that the rear surface of opening 52 is displaced forwardly as regards the rear surfaces of openings 35 and 55. The forward surface of opening 52 is likewise displaced forwardly although due to the convex projection on said forward surface the flat areas 53 are substantially in vertical alignment with the forward edge of openings 35 and 55. With the opening 52 in the shank 16 positioned as shown in Figure 8 it is possible to partially insert the retaining pin 30 by hand. The rounded bottom extremity of the clamp or C-shaped member 31 has been provided to facilitate the introduction of the clamping member or retaining pin into the openings thus provided, and in this connection it will also be observed that the concavity in the forward surface of the clamp is a necessary feature or otherwise it would be impossible to insert the clamping member into the opening 52.

In order to force the clamping member beyond the position as shown in Figure 8 it is necessary to apply force thereto, for which purpose a hammer or similar instrument may be employed and as the member is driven into opening 52 the rubber pad 33 will be fully compressed and eventually the parts will assume the position as shown in Figure 9. Here again it will be observed that the concavity in the forward surface of the clamp coacts with the convex protrusion on the forward surface of opening 52 to permit continued insertion of the clamping member. For example, it will be seen that the sloping side area 51 aligns with sloping area 54 and the action is such as to allow continued downward movement of the clamping member.

Figure 10 illustrates the position of the parts with the clamping member fully inserted and with the rubber pad under maximum compression. The complementary nature of the concavity provided by the clamp and the convex protrusion on the forward wall of opening 52 is clearly illustrated. For this initial positioning the clamp 31 is engaged top and bottom by the forward wall of openings 35 and 55, respectively. The wedge, centrally thereof, is in contact with the rear wall of opening 52. Accordingly, the adapter and thus the dipper tooth is securely retained and actually locked in position on the dipper lip of the bucket and provision is made for expansion of the clamping member for the necessary take-up or "draw" so that the adapter will be automatically tightened as wear takes place between bearing surfaces. The present clamping member accordingly functions similar to a tapered wedge but without the necessity of manual adjustments.

Experience indicates that the adapter of a dipper tooth will move rearwardly on the bearing surfaces approximately three-sixteenths of an inch during its normal life. Accordingly, it was necessary in designing the present retaining pin to provide for at least three-sixteenths of an inch "draw" or take-up between fully compressed and expanded positions. This feature alone would seen to preclude the possibility of using any type of flexible connection because of the interference or obstruction presented by the offset openings. The present retaining pin has been designed to circumvent this obstacle. Actually the configurations which make it possible to install the present clamping member in the first place also serve to prevent it from being inadvertently displaced or backed out of the openings, regardless of the amount of pressure or lack of pressure on the rubber pad. This can best be illustrated by reference to Figure 11 which shows the position of the parts after usage of the dipper tooth to the extent that all the "draw" has been taken up. The effectiveness of tapered and flexible connections of the conventional type decreases in proportion to the amount of tension that is taken off the holding member. The connection becomes increasingly loose and will eventually fall out or completely fail. This is especially objectionable in connection with dipper teeth which are not visible to the operator. Should digging continue following release of the clamp the tooth and lip might be ruined, necessitating replacement of these expensive parts. In the present clamping member, as tension is relieved the locking action of the complementary surfaces becomes more effective.

During the act of inserting the clamping member, one end of the rubber pad is subjected to compression, whereas, the opposite end is subjected to tension. It was found that unless some means of holding the wedge to the clamp is provided difficulty would be experienced as a result of this distortion of the rubber member. This accounts for the present locking feature of the present member comprising the projections 38 and 39 which have interfitting relation within the recesses 36 and 37 of the clamp. The over-all dimensions of the member are not increased and the retaining means does not present any interference to the action of the rubber pad during service.

Another advantage of the present clamping member is the absence of projections on either side of the dipper lip. The member is not subjected to excessive wear and is not liable to become loosened or knocked out, which has been a major disadvantage in the use of tapered wedges or clamps. It is also possible to form the head 34 of the clamp of similar shape with respect to opening 35 in the top surface of the dipper lip and thus the opening can be completely closed by the present clamping member. It is also possible to close the opening in the bottom surface 12 by the plug 56.

The modification shown in Figure 12 is designed for adapters having spaced shank members and which have interfitting relation respectively with the top and bottom surfaces of the dipper lip. Accordingly, in said figure the dipper lip is indicated by numeral 110, the top shank member by 116, and the bottom shank member by 119. The opening 135 in the top shank member is large enough to receive the two-part clamping structure shown in this figure. Also the opening 155 in the bottom shank member is capable of accommodating both parts of the structure which includes a clamping member 130, such as shown in Figure 3, and a C-clamp identified by numeral 160. The clamping member 130 is modified to the extent of including a flange portion 161 located at the rear edge adjacent the top. Also a projection 162 may be provided on the rear edge adjacent the bottom but the same is optional and may be omitted. Of course, the clamping member 130 is provided with the concavity which is on the rear surface in this modification and the complementary shaped projection is formed on the forward surface of the C-clamp 160. The end projections 162' and 163 coact with the surfaces 164 and 165 provided by the top and bottom shank members to retain the C-clamp in place.

Figure 13 illustrates the application and use of the clamping member such as shown in Figures 6 and 7 for releasably locking a replaceable point to its adapter. The adapter is generally indicated by numeral 210, the same having suitable shank means such as 211 and a base portion 212 on which is provided an integral forwardly extending nose portion. Said nose portion, generally indicated by numeral 213, has a laterally extending horizontal opening or passage therethrough such as 214 for accommodating a key or clamping member to be presently de-

scribed. The replaceable point 215 is provided with the conventional forward cutting edge 216 and said point is provided with a rear cavity adapted to receive the nose portion whereby the replaceable point is mounted on said nose portion. As a result of the cavity the rear of the replaceable point is substantially boxlike in formation, having side walls at 217 and 218. Said side walls are apertured as at 220 and 221, the opening being disposed in substantial alignment with passage 214 when the replaceable point is mounted in proper associated relation on the nose portion of the adapter.

The rear wall of the passage 214 is provided with a special shape which is necessary to accommodate the present clamping member. Accordingly, said rear wall is convex in contour, the same having the protruding flat area 222, which gradually merges into the normal surface of the passage as a result of the sloping side areas 223 and 224. The clamping member, generally indicated by numeral 225, has the approximate shape as shown in Figure 6, and essentially consists of the C-clamp 226, the wedge 227 and the rubber pad 228 having a position between the clamp and wedge and being suitably bonded to said metal elements. The rear surface of the C-clamp 226 is provided with the usual concavity characterized by the flat bottom area 230 and by the sloping side areas 231 and 232.

The locking action of the clamping member 225 with respect to the replaceable point 215 is similar in all respects to the locking action as described in connection with the dipper lip and shank. In the structure of Figure 13 the adapter 210 is fixed to the lip of the bucket and thus the adapter and nose portion 213 may be considered as the fixed element of the structure. The replaceable point 215 is adapted to have movement with respect thereto and a considerable part of said movement is due to the wear between the parts as a result of the pounding to which the replaceable point is subjected during use. Accordingly, when the replaceable point is initially applied to the nose portion of the adapter the openings 220 and 221 in the point are offset forwardly with respect to the passage 214 in the nose portion. As wear takes place the passage comes into substantial alignment. The clamping member 225 can be inserted in the openings and passage in a manner as described with respect to Figures 8 to 11 inclusive, and upon full insertion of the member the rubber pad 228 will be compressed to its maximum extent so that tension is exerted in a rearward direction on respective sides of the replaceable point for retaining the same on the nose portion 213. Accordingly, the parts are locked in assembled relation with provision being made for expansion of the clamping member for the necessary take-up or draw so that the replaceable point will be automatically tightened as wear takes place between said point and the nose portion. When it becomes necessary to renew the point 215 the clamping member 225 can be withdrawn and reinserted with the new point.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. A retaining pin for separable parts of a dipper tooth or the like comprising a generally C-shaped member having an elongated shank and relatively short top and bottom extensions projecting forwardly from the shank substantially normal to the shank, said top and bottom extensions having recesses in the inwardly disposed faces thereof and said recesses each having a forward wall, a wedge disposed between said extensions, said wedge having projections at the top and bottom thereof respectively fitting loosely in said recesses and adapted to abut the forward walls of the respective recesses so as to limit displacement of the wedge outwardly in a forward direction in respect of the C-shaped member, and resilient means interposed between the opposed faces of the C-shaped member and the wedge to normally urge the wedge outwardly toward its limit position.

2. A retaining pin according to claim 1 wherein the forward face of the wedge is arcuate at least in part and wherein corners of the C-shaped member are rounded to facilitate entry of the retaining pin between the separable parts.

3. A retaining pin according to claim 1 wherein the top extension of the C-shaped member is shaped complementary to a recess in an outward wall of one of the separable parts to fit therein in a recessed relation when the retaining pin is fully seated between the separable parts.

4. In a dipper tooth construction, the combination including a dipper lip having a recess and forwardly projecting nose portions on respective sides of the recess, a dipper tooth having a rearwardly extending shank member and having bearing surfaces complementary in shape to the nose portions, said shank member being received by the recess and the bearing surfaces having contact with the nose portions when the dipper tooth is mounted on the dipper lip, said dipper lip having aligned openings in the top and bottom walls respectively at the rear end of the recess, said shank member having an opening therethrough having front and rear walls and which is substantially aligned with the openings in the dipper lip when the dipper tooth is mounted thereon, a retaining pin for holding the shank member in locked relation within the recess, said retaining pin having location in the aligned openings and having portions in contact top and bottom with the walls of the dipper lip and adapted to contact the rear wall of the opening in the shank member at an intermediate point, said retaining pin including a C-shaped member having a depression formed in one wall thereof and the forward wall of the opening in the shank member providing a projection which interfits with said depression whereby to facilitate the insertion of the retaining pin in the aligned openings and to hold the retaining pin in operative position during use of the dipper tooth, said C-shaped member of the retaining pin having relatively short top and bottom extensions projecting in the direction of the rear wall of the opening in said shank, said top and bottom extensions having recesses formed in the inwardly disposed faces thereof and said recesses each having a rear end wall, a wedge disposed between said extensions of the C-shaped member, said wedge having projections at the top and bottom thereof respectively fitting loosely in said recesses and adapted to abut said end walls of the respective recesses to limit displacement of the wedge in the direction of the rear wall of the opening in said shank, and resilient means interposed between opposed faces of the C-shaped member and the wedge to normally urge the wedge forcefully against the rear wall of the opening in said shank.

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