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ADJUSTABLE CONNECTION FOR TOOL HEADS AND OPERATING HANDLES

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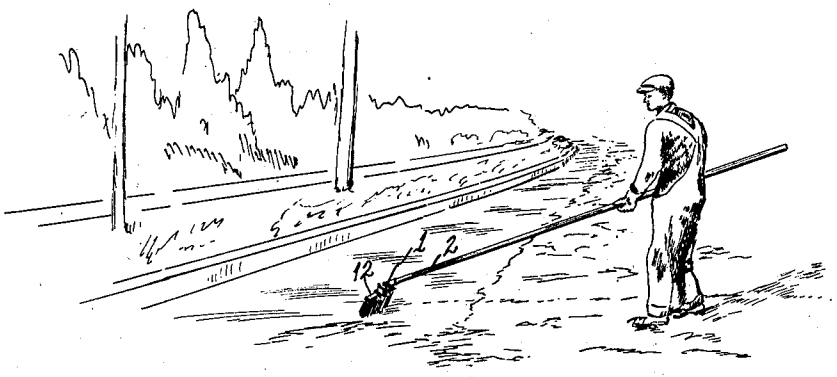


Fig. 1.

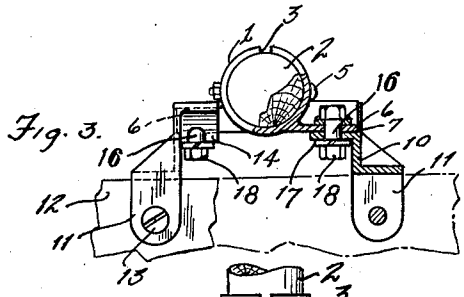


Fig. 3.

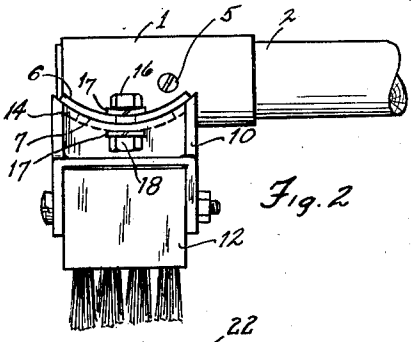


Fig. 2.

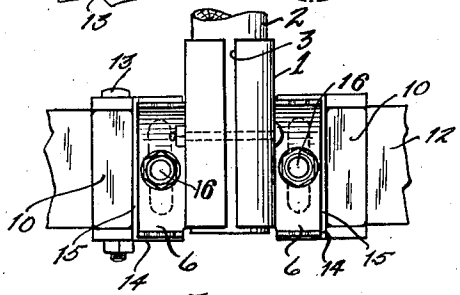


Fig. 4.

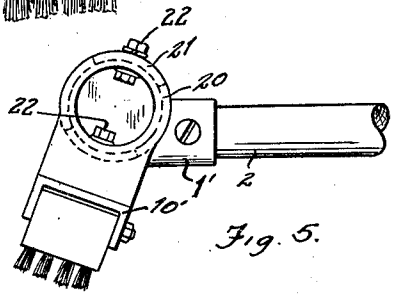


Fig. 5.

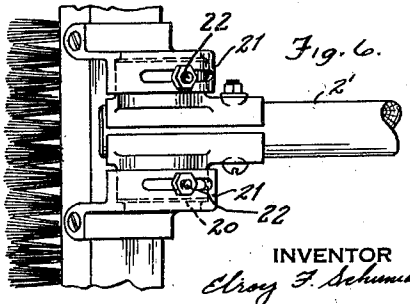


Fig. 6.

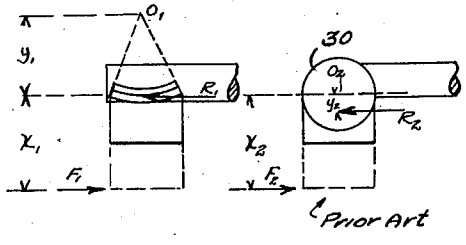


Fig. 7. Prior Art

Fig. 8.

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ADJUSTABLE CONNECTION FOR TOOL HEADS AND OPERATING HANDLES

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4 Claims. (Cl. 306—10)

This invention relates to an adjustable connection for connecting various tool heads to the operating handles.

For the purposes of illustration the use and desirability of such a device is best illustrated by describing its application to road building tools such as brushes, floats, straight edges and the like which are operated from an extremely long operating handle, its use for window cleaning or other devices being apparent therefrom.

In various States the statutes require that the surface of cement pavements be of a brushed finish so as to break up the surface and light floating material as upon failure to do so this material forms a light scale which pits and chips out of the finished surface. Experience has proven that a stiff bristle brush is most satisfactory for this purpose. However, in using such a brush, it is necessary that the brush be inclined slightly toward the operator inasmuch as if the brush is disposed with the bristles too nearly vertical there is tendency to splatter the material. On the other hand, if the brush is inclined at too great an angle, many of the bristles are not effective as a brush but act more or less as a solid board or drag which drags the surface too heavily or renders it uneven. A few trials, however, demonstrate the most effective angle for the particular brush. Other tool heads likewise can be utilized efficiently only when disposed at the proper angle relative to the operating handle.

Since all such tools are often used at various times by different workmen or operators it is desirable that the angular relation of the handle and brush be capable of being varied according to the physical characteristics of the particular operator and the position from which the tool must be operated. It is also highly necessary that a very firm and rigid connection between the brush and other tool heads and the handle is maintained and that such connection can be varied conveniently when desired.

With these problems in mind it is one of the principal objects of the present invention to provide an adjustable connection for connecting a tool head and handle which connection can be operated to provide any required angular relation between the brush or tool head and the handle and which will retain the brush firmly in the adjusted position.

Another object is to provide a connection in which the adjustment can be set without unduly stressing any of the working parts and without requiring undue clamping pressure, yet which, if occasion demands, may be stressed into engagement without damage to the working parts.

Still another object resides in the provision of a device of this character in which the parts may be readily broken loose after having remained in use in one position for a long period of time.

A more specific object is to provide a means by which the handle may be secured firmly to the adjustable connection.

Other objects and advantages will become apparent from the following specification wherein reference is made to the drawing.

In the drawing:

Fig. 1 is a diagrammatic illustration showing the manner of using a roadway brush incorporating the principles of the present invention;

Fig. 2 is an enlarged side elevation of the adjustable connection;

Fig. 3 is a front elevation of the connection, part thereof being shown in section for clearness in illustration;

Fig. 4 is a plan view of the connection;

Fig. 5 is a side elevation illustrating a modified form of the connection;

Fig. 6 is a plan view of the modified structure shown in Fig. 5;

Fig. 7 is a diagrammatic illustration of the stresses and reactionary forces therefor in a structure of the present invention; and

Fig. 8 is a diagrammatic view showing the stresses and reactionary forces in one of the commonly used prior structures comparable in size to the present structure.

Referring to Figs. 1 to 4, the adjustable connection comprises a body member 1 adapted to be secured to a suitable operating handle 2. The body is preferably a cylindrical shell open at both ends so as to receive the handle endwise and slotted longitudinally along one portion, as indicated at 3, so that the shell can be contracted tightly about the handle. Aligned passages are provided transversely of the shell in a position for alignment with a passage extending through the handle 2 so that a suitable bolt 5 may be passed therethrough and through the handle and secured tightly in place, thus directly securing the handle against endwise movement out of the body and also drawing the shell tightly thereabout to provide a tight fit between the two.

Near the outer end of the body member means are provided which have an abutment surface extending transversely of the body and handle.

The most suitable manner of providing such means is clearly illustrated in Figs. 2 and 3.

As there illustrated, laterally extending fins 6 are provided on opposite sides of the body member, each of these fins preferably being arcuate in cross section so as to provide an arcuate abutment surface 7, the axis of which extends transversely of the axis of the handle and is spaced beyond and on the opposite side of the axis of the handle from the fins. The fins 6 are likewise preferably arcuate on the upper surface, as shown, for a purpose later to be described.

Suitable elements adapted for engagement with the particular tool head being used are also provided. For example, in the case of a brush, these elements may comprise a pair of brackets, each bracket preferably comprising a body 10 having downwardly depending yoke arms 11 adapted to receive and snugly embrace therebetween the brush head 12, a bolt 13 or other securing device being provided for securing each pair of yoke arms and brush or tool head firmly together. If desired, an equivalent single bracket may be used, however. Surmounting the body 10 is a fin or flange 14, the upper abutment surface 15 of which is arcuate and complementary to the surface 7 of the fin 6 and preferably of greater length circumferentially. The bracket body 10 is so positioned relative to the fin 14 that when the surfaces 7 and 15 are moved circumferentially relative to each other while in contact the body 12 and the fin 14 of each bracket will clear the end of the body member 1 or protruding end of the handle 2. The fins 6 and 14 are each provided with openings extending through the respective abutment surfaces and aligned axially thereof with each other so as to permit passage of a suitable clamping screw 16 therethrough.

In the form illustrated, the passage in the fin 6 is preferably of sufficient size only to receive the screw, the passage in the fin 14 being elongated so as to permit relative rotation of the two fins clamping thereof in face to face relationship in various adjusted rotated position. Suitable lock washers, such as indicated at 17, may be provided for insuring a firm bearing between the locking screw 16 and its locking nut and the respective fins.

By making both the fins 6 and 14 arcuate in cross section it is possible to warp the same into stressed engagement when the occasion demands though under normal working conditions this is not necessary for obtaining a sufficient degree of clamping. It is apparent that by loosening the locking nut 18 the bracket 10 may be swung to different positions by sliding the surface 15 along the surface 7 and that the fins may be secured in firm face to face abutting relationship in various relatively rotated positions as required.

Referring to Figs. 5 and 6, there is illustrated a modified form of the apparatus having some of the advantages above pointed out but which differs from the structure above described in that instead of the arcuate fins 6, laterally extending cylindrical fins 20 are provided on the body, and instead of the arcuate fins 14, cylindrical fins 21 are provided on the brackets 19', the fins 21 being adapted to fit over the outside of the fins 20. Axially aligned circumferential passages may be provided in the fins 20 and 21 respectively, and suitable locking screws 22 inserted therethrough for clamping the fins 20 and 21 with their complementary surfaces in firm face to face contact.

Referring to Figs. 7 and 8 the advantages of the structure illustrated in Figs. 2 to 4 are more clearly illustrated. In Fig. 8 the usual manner of securing a tool head to an operating handle is shown. This customary practice constitutes providing a rigid body secured to the tool head and carrying at the top or some convenient position a flat circular pad 30 adapted to lie in face to face contact with a suitable surface on the handle supporting body so that the clamping faces of the pad and such surface are disposed vertically instead of horizontally as in the present structure. These abutment surfaces are drawn into firm contact by passage of a suitable pivot transversely of the axis of the stem and centrally through the abutment surfaces, as at O_2.

In Fig. 7 a tool and handle made in accordance with the present invention and comparable in size to that shown in Fig. 8 is diagrammatically illustrated. Upon comparing the two it is apparent that abutment surfaces used for clamping may be of the same area in both cases. In Fig. 8, however, since the pivot extends through the flat pad 30, a high degree of clamping pressure cannot be obtained except through that portion of the pad surface close to the screw, the outer marginal portions of the pad not being drawn as firmly into contact with the surface on the body. In the present structure, however, since both fins are arcuate in outline and the locking screw or washers extend a considerable distance to each side of the screw, the pressure between the abutment surfaces may be more evenly distributed. Again, also because the fins are arcuate in cross section, each may be more rigid and drawn together over their full contact surfaces by a single centrally disposed screw, as illustrated in Fig. 2.

More important however is the manner in which the force F, resulting from operation of the brush is overcome. Assuming the forces F_1 and F_2 to be the same in both instances in Figs. 7 and 8, in the prior structure of Fig. 8 the force F_2 is directly effective to rotate the brush about the pivotal axis O_2. In Fig. 7 the force F_1 is effective radially of the clamping screw and tends to pinch a portion of the abutment surfaces more tightly together. As above described, however, the abutment surfaces in the present structure are curved about an axis disposed above the body preferably on the opposite side of the handle axis from the fins. Thus the force F_1 which is effective to cause relative rotation of the fins 6 and 14 must rotate them about their axis of curvature. This force must be resisted by a resistance force R_1 which is effected by the clamping or abutment surfaces. In Fig. 8 the resisting force R_2 is necessarily close to the pivotal center O_2 while in the present structure the force R_1 acts about the same axis of curvature about which the fins are curved. The reacting force R_2 in Fig. 8 would act at a distance Y_2 from the pivotal axis O_2, while the force F_2 would act at a distance X_2 from the pivotal axis O_2. Consequently, $F_2(X_2)$ must equal $R_2(Y_2)$, or R_2 equals $F(X_2)/Y_2$. Due to the fact that Y_2 is so much less than X_2, a tremendous resisting force is required. Referring to Fig. 7 the reacting force R_1 is distant Y_1 from the pivotal axis O_1 and the force F_1 at a distance X_1 and Y_1 therefrom. Therefore R_1 equals $F_1(X_1 \text{ plus } Y_1)/Y_1$. By scaling the dimensions of the illustrations of structures which are comparable in size, X_1 equals X_2 equals 6 units, Y_2 equals 1 unit, and Y_1 5 units. If, as stated F_1 equals F_2 therefore R_1 equals $F(6 \text{ plus } 5)/5$ equals $2F$. R_2 equals $F(6/1)$ equals $6F$. Obviously, therefore the reacting force which

must be provided by friction between the abutment surface is much smaller in the present structure than in the structure illustrated in Fig. 5, in fact, only one third as great. Obviously, it can be made still smaller relative to the force F_1 by decreasing the degree of curvature of the surface of the fins **6** and **14**, which step results in an increase in the radius of curvature Y_1. This can be accomplished without increasing the bulk and weight of the connection, a matter to be considered when operating a tool from the end of a long handle, whereas in the prior structures, any change in the pad **30** to obtain more effective results must be accompanied by an increase in weight.

It is apparent therefore that the present invention has many advantages over the structures heretofore used, not only in that it may be made more conveniently and can be taken apart readily after a long use but also because actually the working parts thereof are subjected to a more uniform stress and each individual part to less stress for a given degree of clamping resistance than in prior structures.

Having thus described my invention, I claim:

1. An adjustable connection for securing a tool head and operating handle in predetermined adjusted relations with respect to each other comprising a body member adapted to be secured to the operating handle, clamping fins extending outwardly from opposite sides of the body, said fins being arcuate in cross section and having arcuate contact surfaces, the axis of curvature of said surfaces extending transversely of the body, supporting means having arcuate surfaces complementary respectively to the contact surfaces of the fins and in face to face abutting relationship thereto, said means being adapted for connection to the tool head, and means for stressing said fins and supporting means into engagement for retaining said abutting surfaces into firm contact in different relative circumferential positions.

2. An adjustable connection for connecting a tool head to an elongated operating handle comprising a body member adapted for engagement with the handle, supporting means extending outwardly laterally from opposite sides of the body member and having arcuate abutment surfaces, the axis of said surfaces extending transversely relative to the axis of the handle when the handle is connected to the body member, supported means adapted to be secured to the tool head and having arcuate abutment surfaces complementary to and in face to face contact with the first mentioned surfaces respectively, and manually operable means operatively connected to the respective supporting means and their associated supported means for clamping the contacting abutment surfaces of the supporting and supported means into firm contact relation in circumferentially adjusted positions.

3. A device for the purposes described comprising an elongated body adapted to receive an operating handle endwise, lateral clamping fins of arcuate cross section extending from opposite sides of the body and spaced below the axis thereof, means adapted to be rigidly secured to a tool head and having arcuate contact surfaces complementary to the fins, passages through each fin and its corresponding complementary contact means, said passages being in register axially of the fins, one of said passages being elongated circumferentially, and bolt and nut means respective to each fin and extending through the registered openings for drawing each fin and its complementary surface into stressed engagement with each other in predetermined relative circumferential positions.

4. An adjustable connection for connecting a tool head to an operating handle comprising a body member adapted for connection to the handle, cylindrical coaxial shells extending laterally from opposite sides of the body member, the common axis of said shells extending transversely of the handle, means adapted for connection with a tool head and having arcuate abutment surfaces adapted to lie in face to face abutting relationship to surface areas of the respective shells, and means for clamping said abutting surfaces into tight contact with respect to each other.

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