Jan. 30, 1962 A. H. SMITH 3,019,042

COUPLING ELEMENT

Filed June 11, 1959

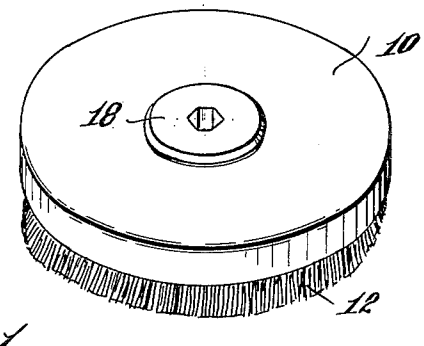

Fig. 1

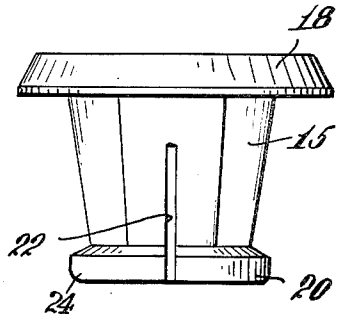

Fig. 2

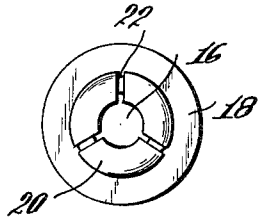

Fig. 7

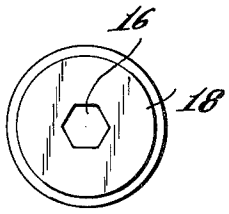

Fig. 6

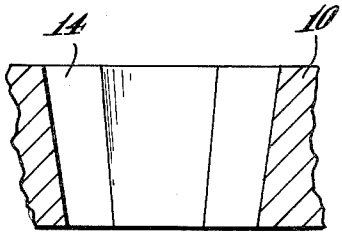

Fig. 3

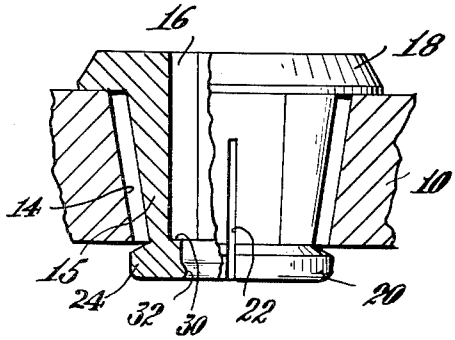

Fig. 4

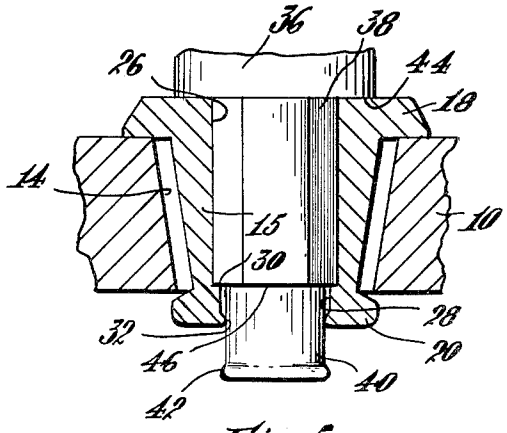

Fig. 5

INVENTOR.
Aaron H. Smith
BY
Roberts, Cushman & Grover
ATT'YS

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3,019,042

COUPLING ELEMENT

Aaron H. Smith, Ipswich, Mass., assignor to Signal Manufacturing Co., Salem, Mass., a corporation of Massachusetts

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This invention relates to a device for connecting two members together and more especially to drivably connecting a rotable element such as an applicator disc or brush to the drive shaft of a power-driven floor machine.

It is customary in the manufacture of applicator discs, brushes and the like, for power-driven floor machines, to provide driving couplings of a kind to permit the applicator or brush to be easily attached and detached. Usually the coupling consists of a part, for example a sleeve which is fastened in a hole in the head of the applicator of brush, the sleeve being engageable with the lower end of the drive shaft, and a retaining element, such as a latch, fastened to the head and engageable with a groove on the shaft. Thus each applicator or brush entails an assembly operation which is slow and costly, in addition to the cost of the several parts making up the coupling.

The principal objects of this invention are to provide a coupling element for removably and drivably coupling an applicator or brush to a shaft which need not be assembled with the applicator or brush prior to use and therefore does not entail manufacturing losses; to provide a coupling element which does not require fastening elements to attach it to the applicator or brush head; to provide a coupling element which does not require a latch for securing the applicator or brush to the drive shaft; to provide a coupling element which can easily be assembled with the applicator or brush head and may be used with different applicators or brushes so that it is not necessary to equip each one with a coupling as an integral part thereof, thereby reducing the cost of manufacturing; to provide a coupling which will hold the applicator or brush securely on the shaft and insure rotation thereof with the shaft, while at the same time permitting it to move lengthwise, that is axially of the shaft, and to a limited amount to rock, that is to tilt with respect to the axis of the shaft; and to provide a coupling element which is extremely simple and inexpensive to manufacturing and one which is durable.

As herein illustrated, the coupling comprises a body adapted to be inserted into a hole in the head of an applicator or brush having an axial bore adapted to receive the drive shaft and end flanges at its opposite ends, the flanges and the external surface of the body collectively forming a groove concentric with the hole for receiving and retaining that portion of the head of the applicator or brush marginally of the hole. The flanges are larger than the hole and one of the flanges and the body inwardly thereof contain axially extending, radially disposed slots permitting the flange at that end to be constricted so that it can be pushed through the hole. The substance of the element is resilient enough so that when the constricted flange emerges from the hole it returns to its normal size for engagement with the head at that side. The two flanges operate to hold the coupling in the hole so long as the slotted end is not constricted. Preferably the body is tapered and the flange at the slotted end is smaller than the flange at the opposite end. The applicator or brush head has a correspondingly tapered opening through it and the coupling element is assembled therewith by thrusting the smaller end into the wider end of the opening and pushing it through, the lateral pressure on the flange, at it is pushed through, operating to constrict the flange. The body of the coupling element contains an axial opening which is multisided for non-rotatable engagement with a correspondingly shaped drive shaft and has portions of different cross-section, the portion of larger cross-section extending from the outer side of the flange at one end to substantially the inner side of the flange at the other end. The junction of the portions of larger and smaller area provides an internal annular shoulder. The drive shaft has corresponding portions of larger and smaller cross-section for engagement with the portions of larger and smaller cross-section in the coupling element, and the shoulder at the junction of the larger and smaller portions of the shaft is adapted to engage the shoulder within the sleeve. That portion of the hole of smaller cross-section has also, adjacent the flange at that end, an internal bead, and the shaft has at its end an enlargement which may be thrust through the beaded portion of the hole by expansion of the flange, the bead serving to hold the applicator or brush on the shaft when the enlargement has passed through it and the flange has contracted to normal size. There is sufficient clearance between the external surface of the body and the coupling element and the hole in the applicator or brush head to allow the coupling element to expand as the enlarged portion is pushed by the bead and after contraction to allow rocking or tilting of the applicator or brush relative to the coupling. The axial length of that portion of the shaft of smaller cross-section between the shoulder and the enlargement is greater than the axial length of that portion of the opening within the coupling element between the shoulder and the bead so that the coupling element is free to move axially a limited amount.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

FIG. 1 is an oblique projection of a brush head showing the coupling element associated therewith;

FIG. 2 is an elevation of the coupling element to much larger scale;

FIG. 3 is a fragmentary section to larger scale diametrically of the brush head, showing the central hole in the brush head which is adapted to receive the coupling element;

FIG. 4 is a diametrical section through the brush head showing the coupling element interengaged with the hole therein;

FIG. 5 is a diametrical section showing the drive shaft of a floor machine engaged with the coupling after the latter has been inserted in the brush head;

FIG. 6 is a top view of the coupling element to somewhat smaller scale; and

FIG. 7 is a bottom view of the coupling element to the same scale.

Referring to the drawings there is shown a circular head **10** comprised of a plastic material, wood or the like, to the underside of which are fixed bristles **12**, it being understood however that the bristles may be replaced by a pad of felt, sponge rubber, fabric or any other suitable material for treating floors, rugs and the like. At the center of the head **10** (FIG. 3) there is an opening **14** which is hexagonal in cross-section and tapers from a wider opening at the top to a smaller opening at the bottom.

Preferably the head **10** is made to size by molding wood chips or flour with a thermosetting plastic composition with the central hole **14** into which the coupling is to be inserted and suitable recesses in its lower side for receiving bristle bundles if the applicator is to be a brush or with a smooth lower side if a pad is to be attached thereto. As thus made up, the brush or applicator head

consists solely of a molding without attaching means of any kind assembled with or fastened thereto.

The coupling element is made independently of the head and, as shown in elevation in FIG. 2, comprises a body 15 containing an axial hole or opening 16 (FIG. 4) and end flanges 18 and 20 at its opposite ends, the flange 18 being larger than the larger end of the opening 16 and the flange 20 being larger than the smaller end of the opening but smaller than the larger end of the opening. The body intermediate the flanges is non-circular, preferably polygonal, and tapers from the larger flange toward the smaller flange as does the opening 14 in the head. The cross-section of the body however is smaller than the opening 14, as shown in FIG. 4, so that when the body is inserted into the hole there will be a clearance between its external surface and the internal surface of the hole 14. The end flanges and the external surface of the body collectively form a groove peripherally of the coupling, which embraces the head marginally of the opening 14 so as to retain the coupling in the head after it has been inserted. The inner side of the flange 18 is perpendicular to the axis of the opening 16 and the inner side of the flange 20 is inclined thereto, thereby allowing the head and coupling element to rock relative to each other.

To allow for assembling the coupling element with the head, slots 22 are cut through the flange 20 axially along the body 15 toward the flange 18, there being three of these slots shown herein (FIG. 7) spaced uniformly about the longitudinal axis of the body and disposed radially with respect to the axis. The slots 22 are wide enough so that the body 15 and the flange 20 may be constricted by applying lateral pressure to the flange sufficiently to allow the flange 20 to pass through the lower end of the opening 14. This is accomplished by thrusting the flange 20 into the upper end of the opening 14 and pressing downwardly on the coupling element so as to squeeze the flange 18 against the sloping sides of the hole 14. By continued pressure the flange 20 may be squeezed through the lower end of the opening 14 and then, because of the natural elasticity of the body, the flange will re-expand to its normal size as shown in FIG. 4, so that the coupling element cannot be withdrawn except by re-compressing the flange. Thus, as shown in FIG. 4, the two flanges 18 and 20, by engagement with opposite sides of the brush head, hold the coupling element in place but with sufficient clearance to permit wobble. To facilitate introducing the coupling element and removing it, the outer side of the flange 20 is rounded off as shown at 24, so that it will not dig into the wall of the hole 14 as it is pressed thereinto.

The axial hole 16, as shown in FIG. 5 has portions 26 and 28 of different cross-section, the portion 26 being the larger and polygonal in shape and extending from the outer end of the flange 18 substantially to the inner end of the flange 20. The portion of smaller cross-section 28 is cylindrical in shape and extends from the inner end of the portion 26 through the flange 20. At the junction of the portions 26 and 28 there is an annular shoulder 30, and near the end of the portion 28, adjacent the outer side of the flange 20, there is an inwardly extending bead 32.

The shaft 36 has portions 38 and 40 of different cross-section adapted to be engaged with the portions 28 and 30 of the hole in the coupling element. The portion 38 is polygonal, corresponding substantially in cross-section to the portion 26 of the coupling element, and the portion 30 is cylindrical and is somewhat smaller in cross-section than the portion 28 of the coupling element, corresponding substantially in cross-section to the area bounded by the bead 32. The cylindrical portion 40 has, at its end, an enlargement in the form of the bead 42. At the junction of the polygonal portion 38 with the shaft 36, there is a shoulder 44, and at the junction of the cylindrical portion 40 with the polygonal portion 38 there is another shoulder 46. As thus constructed, when the shaft 36 is thrust downwardly through the opening 16 the enlargement 42 at the end of the cylindrical portion 40, by engagement with the bead 32 internally of the coupling element, expands the flange 20 sufficiently to permit the enlarged end to pass through, there being sufficient clearance between the outside of the element and of the hole in the head to permit such expansion. After the enlargement passes through the end of the coupling element, the flange returns to its normal size so that the bead bears upon the reduced cylindrical portion behind the enlarged portion of the shaft and hence the shaft cannot be withdrawn from the coupling element without first re-expanding the flange. When thrust into the coupling element the shoulders 44 and 46 engage respectively the outer side of the flange 18 of the coupling element and the annular shoulder 30 internally of the coupling element and serve as thrust bearings which limit the upward movement of the brush on the shaft. The cylindrical portion 40 is axially longer than the axial distance between the shoulder 30 and the bead 32 and hence it is apparent that the coupling element can slide downwardly along the shaft until the bead 32 engages the inner side of the enlargment 42. This permits vertical movement of the brush relative to the shaft.

The coupling element as thus described is an integrated molding of a suitable plastic, for example, Teflon, and contains no metal parts so that it is extremely cheap to manufacture and yet is extremely durable.

The coupling is easy to apply to the brush back and easy to engage with the shaft. Since the coupling element is not permanently attached to the brush head it may be used for as many brush heads or applicators as the apparatus may be equipped with, thereby reducing the cost of manufacture both with respect to the manufacture of the brush itself, assembling costs and the use of several brushes with one machine.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A coupling element for connecting a driving element within an opening in an element to be driven thereby, comprising a body having an outer side adapted to be non-rotatably disposed in the opening in the element to be driven, an axial hole therethrough and end flanges, said body and end flanges being integrally fabricated of a substantially rigid substance, said hole having portions of different cross-section, that of larger cross-section adapted non-rotatably to receive the driving element, said portion of larger cross-section extending from the outer side of the flange at one end substantially to the inner side of the flange at the other end, and said latter flange and the body inwardly thereof containing axially extending, radially disposed slots permitting expansion of that portion of the hole of smaller cross-section, said flanges being adapted to embrace the element to be driven marginally of the opening in it.

2. A coupling element for connecting a driving element within an opening in an element to be driven thereby, comprising a body having an outer side of non-circular cross-section adapted to be non-rotatably disposed in the opening in the element to be driven, an axial hole therethrough and end flanges, said body and end flanges being integrally fabricated of a substantially rigid substance, said hole having portions of different cross-section, that of larger cross-section being non-circular, non-rotatably to receive the driving element, said portion of larger cross-section extending from the outer side of the flange at one end substantially to the inner side of the flange at the other end, the junction of the portions of larger and smaller area forming an internal annular shoulder adjacent said latter flange, and said latter flange and the body inwardly thereof containing axially extending, radially disposed slots permitting expansion of that portion of the hole of smaller cross-section, said flanges being adapted to embrace the element to be driven marginally of the opening in it.

3. A coupling element for connecting a driving element within an opening in an element to be driven thereby, comprising a body having an outer side adapted to be non-rotatably disposed in the opening in the element to be driven, an axial hole therethrough and end flanges, said body and end flanges being integrally fabricated of a substantially rigid substance, said hole having portions of different cross-section, that of larger cross-section adapted non-rotatably to receive the driving element, said portion of larger cross-section extending from the outer side of the flange at one end substantially to the inner side of the flange at the other end, and said portion of smaller cross-section at said latter end being axially smooth, circular and containing an inwardly extending bead, said latter flange and the body inwardly thereof containing axially extending, radially disposed slots permitting expansion of that portion of the hole of smaller cross-section.

4. A coupling element for connecting a driving element within an opening in an element to be driven thereby, comprising a body having an outer side adapted to be non-rotatably disposed in the opening in the element to be driven, an axial hole therethrough and end flanges, said body and end flanges being integrally fabricated of a substantially rigid substance, said hole having portions of

different cross-section, that of larger cross-section adapted non-rotatably to receive the driving element, said portion of larger cross-section extending from the outer side of one flange to substantially the inner side of the other flange, the junction of the portions of larger and smaller area forming an internal annular shoulder adjacent said latter flange, and an inwardly projecting bead within the portion of smaller area adjacent the outer side of the latter flange, said latter flange and the body inwardly thereof containing longitudinally extending, radially disposed slots, said flanges being adapted to embrace the element to be driven marginally of the opening therein.

References Cited in the file of this patent

UNITED STATES PATENTS

652,644	Ross	June 26, 1900
1,592,133	Brewster	July 13, 1926
1,638,300	Gagnon	Aug. 9, 1927
1,672,601	Brent	June 5, 1928
2,719,047	Bayes et al.	Sept. 27, 1955

FOREIGN PATENTS

300,546	Germany	Sept. 15, 1917