# United States Patent [19]

**Belanger**

[11] **3,800,481**

[45] **Apr. 2, 1974**


[54] **HINGE TYPE UNITS PERMANENTLY MOUNTED IN A CYLINDRICAL HUB STRUCTURE WITH REPLACEABLE FINISHING PACKS PROVIDED FOR THE UNITS**


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[52] **U.S. Cl.** ..... **51/337**

[51] **Int. Cl.** ..... **B24b 9/02**

[58] **Field of Search** ..... 51/330–337, 51/358



[56] **References Cited**

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|---|---|---|---|
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[57] **ABSTRACT**

The rotary flap or finishing wheel or tool has a plurality of radially extending finishing units or packs mounted in a circumferential series on a hub structure. The finishing units are mounted on the body structure by a dual clip-type assembly including an inner axially elongated and rigid clip member forming the primary component of the pack and an axially elongated outer clip member supporting or carrying the finishing or fill material and forming the secondary components of the finishing unit. The mount of the inner clip member is afforded at an inner axially extending through-bore therein which encircles an axial pin component located adjacent the outer periphery of the hub structure. The inner clip member has an axially elongated, keyhole-type slot or groove that opens re-entrantly along the entire axial length of the outer free clip end. Replaceable units of fill or finishing material are each constituted in part by the secondary or outer clip component or member having radial arms which are coextensive in axial length with the finishing material and are stapled in place within the latter. The arms integrally connect with one another at a radially inner bight at which, along with a telescoped inner wear sleeve, the pre-assembled finishing unit-secondary clip member — is telescoped into the re-entrant keyhole recess of the primary clip member. Either one or both of the clip members of each finishing unit are mounted for pivotal movement.


**26 Claims, 3 Drawing Figures**

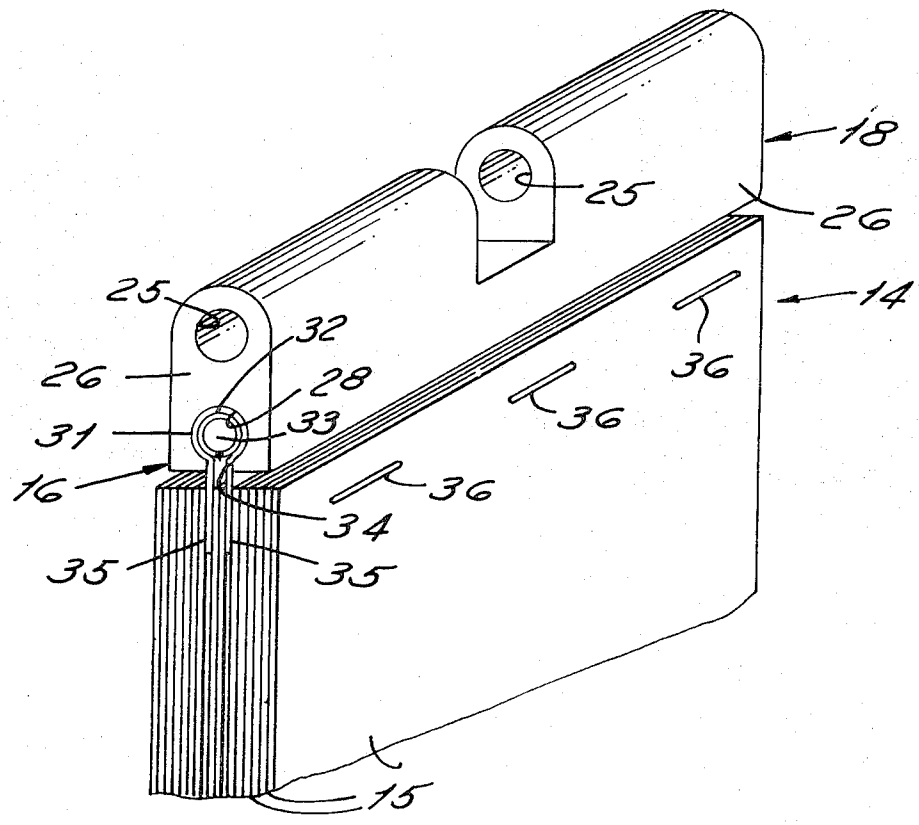


FIG. 1

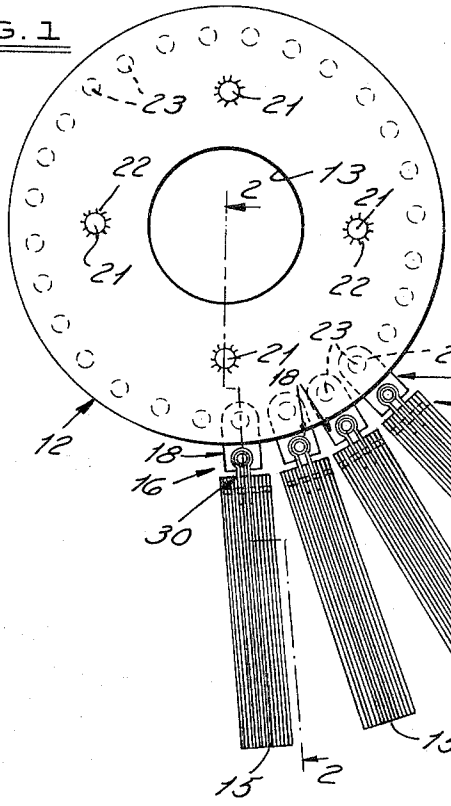



FIG. 2

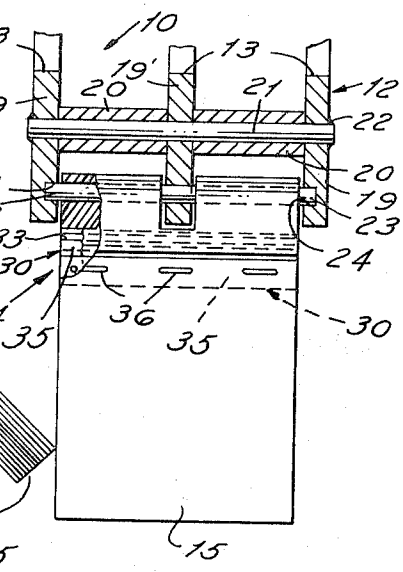
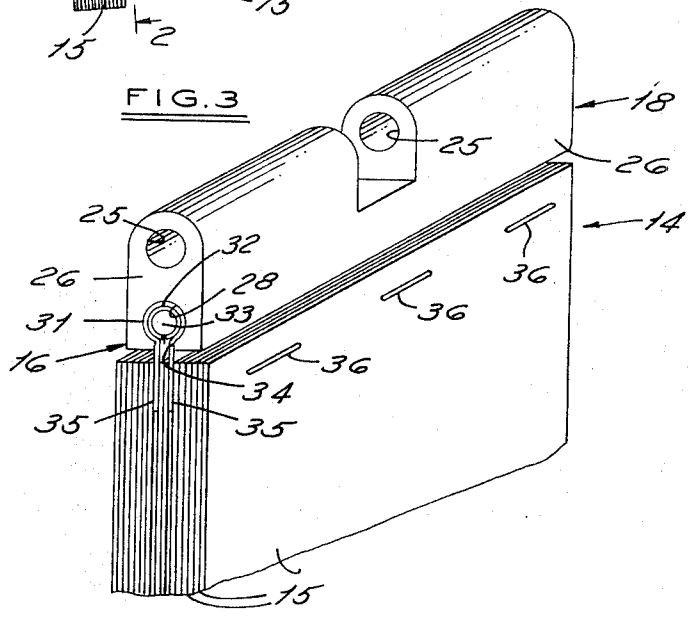



FIG. 3



# HINGE TYPE UNITS PERMANENTLY MOUNTED IN A CYLINDRICAL HUB STRUCTURE WITH REPLACEABLE FINISHING PACKS PROVIDED FOR THE UNITS

## CROSS-REFERENCE TO RELATED APPLICATIONS

My co-pending application, Ser. No. 155,733, filed June 23, 1971 now abandoned, discloses the general type of forked-section clip member which pivots a unit of fill or finishing material on the hub structure. My earlier co-pending application, Ser. No. 885,734, filed Dec. 17, 1969 now U.S. Pat. No. 3,685,217, illustrates and describes various forms of hub structures provided with pivotally mounted finishing units of the general sort dealt with herein, although not as associated with an inner pivotal mounting clip member which may form a permanent component of the hub structure. A concurrently filed application, Ser. No. 253,238, filed May 15, 1962, deals with a dual clip-type pack pivoting concept generally similar to that of the present application.

## BACKGROUND OF THE INVENTION — FIELD

The improved composite abrasive pack and pivoting clip concept of the invention finds application in a large number of rotative surface finishing operations, specifically, in the rough or finish working, brushing, abrasing, buffing, burnishing or polishing of metal or non-metal parts, in which various types of fill material is utilized, as an example, a stacked pack of more or less abrasive sheets, cotton or sisal material. I am aware of no prior art references pertinent to the combination of a hub mounted inner clip member and a replaceable, cartridge-type secondary clip member with fill material as herein shown and described.

## SUMMARY OF THE INVENTION

The improvement represents a considerable refinement of the type of the finishing pack pivoting concept which is the subject matter of my above identified application, Ser. No. 155,733, characterized by a very stable pivotal mounting of the fill material in relation to a wheel structure and drive hub. However, the invention provides a very simple and expeditious means for removing and replacing a worn pack or unit of fill material, or one presenting a different fill or abrasive characteristic, in an operation involving the simple sliding of a secondary clipped pack of fill material out of a primary, permanently assembled clip member and its sliding replacement by another similar pack or unit. Dual pivotal mounting of the secondary clip member, at the pivot of the pack to the primary clip member and at the pivot of that clip member to the hub structure, is another feature characteristic of the improvement.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view of a rotary finishing tool having a hub-applied body plate structure, showing a part of a circumferential array of like abrasive packs as replaceably applied to a clip component of a clip and pack sub-assembly, according to the invention;

FIG. 2 is a fragmentary view of the hub structure and pack combination, being partially broken away and typically sectioned on the broken but generally radial line 2—2 of FIG. 1; and



FIG. 3 is a perspective view also illustrating the nature of the pack's clip and sheet sub-assembly, in larger scale.

## DESCRIPTION OF A PREFERRED EMBODIMENT

A typical rotary finishing wheel or tool **10** according to the invention will basically comprise a mounting plate unit or hub structure **12**, adapted to be fixedly connected to a driving wheel hub (not shown) at axially aligned plate openings **13**, and a plurality of like sheet pack units, each generally designated **14**, which are pivotally mounted individually to the structure **12** in equal circumferential spacing about the latter. The number of packs may, of course, vary, but preferably and usually the circumferential array thereof is such as to afford, when flexed, a substantially continuous circumferential rotative finishing engagement with a workpiece of the outer extremities of the packs or units **14**.

Each of the packs or units **14**, as an example, comprises a combination of a sub-assembly of a stack of identical abrasive sheets **15** or other fill material, and an improved composite clamping and pivoting unit, generally designated **16**, by which the sheets or fill materials are clamped together and pivotally mounted to the hub structure **12**. The sheets of sub-assembly **16** are of plain rectangular outline and may illustratively be of an abrasive coated, emery-type cloth or fabric, or of any other structural composition, as mentioned in my above-identified co-pending applications. These sheets may be uniformly oriented in a stack with the abrasive surfaces of all thereof facing circumferentially in the direction of rotation of the wheel or the leading sheet of each pack or unit reversed so that the abrasive surface thereon faces opposite to the direction of rotation in the manner shown and described in my co-pending application, Ser. No. 253,236, filed May 15, 1972, concurrently herewith.

It should be appreciated that other types of fill materials may be used in sub-assembly **16** in place of the abrasive sheets **15** such as cotton, fabric, sisal, leather, brush-like materials, paper and other types and forms of fill materials now utilized or which can be adapted to perform the required surface finishing operations on metal or non-metal materials. In addition the outer-working edges of the abrasive sheets **15** or of the selected fill materials may be straight as shown or contoured to fit the work. Also the sheets **15** or selected fill materials may be slashed to allow greater flexibility and enable the finishing of contours without pre-contouring the pack as is well known in the art.

The pivoting clamp clip unit **16** for each pack **14** may be considered to comprise two somewhat dissimilar components. One of these, as best shown in FIGS. **1** and **2**, is a primary, radially extending inner clip member **18** in the form of a rigid section of a metallic or non-metallic extrusion of the general nature illustrated and described in my co-pending application, Ser. No. 155,733. Clip member **18** has pivotally articulated thereto a secondary, radially outer pack pivoting and clamping clip member of the unit **16**, which clamping member is later described in detail.

Inner clip member **18** is coextensive in axial length with the sheets **15**, the pack **14** being confined fairly closely at opposite axial ends thereof by two axially end-most plates **19** of the hub mounting plate structure

12, yet is free to pivot individually in action relative to those plates, as well as relative to each optional intermediate plate 19' of the same structure. In the general manner of my application, Ser. No. 885,734, now U.S. Pat. No. 3,685,217, said plates are spaced axially from one another, as an example, by tubular sleeves 20 encircling elongated securing pins 21 which pass through axially aligned openings in plates 19, 19'. Opposite ends of the pins 21 are welded at 22 to end plates 19, or may be rigidly end-restrained relative thereto, as by nut and screw means which are removable. However, it is contemplated in some instances that the plate assembly 12 be a permanent rigid structure, with the radially inner pack pivoting clip members 18 permanently assembled to that structure. However in some cases it is contemplated that the inner clip members 18 may be removed from the hub structure 12 to repair or replace damaged inner clip members 18 without requiring the disposal of the entire hub structure. The present invention may also be used with other forms of hub structures, as an example, as shown in my co-pending application, Ser. No. 885,734, now U.S. Pat. No. 3,685,217, and in my U.S. Pat. Nos. 3,535,833 and 3,621,622.

Therefore, prior to completion of said assembly a series of assembly pack pivoting pins 23, in a number equalling the abrasive packs 14 and equally spaced circumferentially about the plates 19 in radially outward parallelism with the securing pins 21, are seated in inner recesses 24 of those plates, having been passed through a pivot bore 25 in a block-like inner portion 26 of clip member 18, as well as through an opening in the intermediate plate 19', if present. Thus, the inner clips 18 are pivotally pre-mounted as components of the plate assembly 12, enabling a primary, radially inner swing of the several packs 14 on the axes of the pins 23. The inner portion 26 of clip member 18 projects radially outwardly of the periphery of plate unit 12, where it is formed to provide a generally keyhole-shaped or re-entrant, radially outward recess, slot or groove 28, in which a secondary clip component of the two-clip articulating unit 16 is pivotally received.

This secondary component comprises an axially elongated clip element or member 30, made from a plastic or a metallic material, coextensive in length with primary clip member 18, which is formed to provide a radially inner loop or bight portion 31, in a quasi-cylindrical shape and diameter, to be quite snugly received, in an axial displacement-resisting frictional fit, in the corresponding, quasi-cylindrical recess or slot 28 of clip 28.

To this end, the bight portion 31 of clip member 30 is stiffened somewhat by an internal split sleeve or roll pin 32, which encircles and serves as a wear member for an elongated center spine pin 33 of the secondary clip member 30.

Radially elongated arms 35 of each clip member 30 extend through a restricted throat formation 34 of clip slot 28 and, with substantial radial clearance from the primary clip 18, have embedded engagement between sheets 15 of the abrasive pack 14 at a location medial of the thickness of the latter. With the clip arm 35 thus inter-leaved in the radially inner end of the pack's sheet stack, a firm clamp of the latter to the outer clip member 30 is effected by means of rugged staples 36 passing through the arms 35. The bight, sleeve and spine components of outer clip member 30 will ordinarily have adequate resistance to axial displacement from one another by reason of their frictional telescoped interfit. However, this may be supplemented, as by an end solder or weld, if desired, or by removable end caps, not shown, which may be removably mounted on the hub structure engageable with the outer end surfaces of the outer clip members 30 to positively prevent relative lengthwise movement between the inner and outer clip members of each finishing unit. Of course, radial displacement of the secondary clip member 30 from the primary clip member 18 is prevented at the re-entrant throat formation 34 of the latter.

The inner and outer clip members disclosed herein may be made from metals or plastic materials by various forming operations including extruding, molding, machining, etc. which are well known in the art. In addition, the inner clip members must be slotted or otherwise notched, as shown in FIG. 2, in order to receive the outer periphery of the intermediate plate or plates 19'.

The inner clip members may be permanently mounted in the hub structure as shown in the drawing, forming a throw-away wheel or hub structure or the inner clip members may be mounted in a hub structure of a rotary finishing tool which permits replacement of the inner clip members and the packs carried thereby as shown and described in my other patents and applications.

What is claimed is:

1. A pack unit adapted to be mounted on a rotary hub structure, comprising a primary, radially inner clip member having means to pivotally engage the same with the hub structure to swing individually on an axis radially outwardly paralleling the rotative axis of the structure, a unit of finishing material, and means pivotally and replaceably mounting said unit of finishing material on said primary clip member to swing individually relative thereto on an axis paralleling the axes of the structure and inner clip member, said last-named means comprising a secondary, radially outer clip member having a radially inner portion at which it is pivotally and releasably engaged with said primary clip member in spaced relation to the axis of swing of the latter, and means fixedly connecting said outer or secondary clip member to said unit of finishing material at a radially inner portion of the latter.

2. The pack unit of claim 1, in which said primary clip member is relatively rigid and is provided with a first formation in a radially inner body portion thereof at which said primary clip member is pivotally engaged with the structure, and a further formation radially outward of said first formation at which said secondary clip member is thus pivotally and replaceably engaged with the primary clip member.

3. The pack unit of claim 1, in which said primary clip member is relatively rigid and said secondary clip member is of sheet-like material shaped to afford a portion at which the secondary clip member is pivotally engaged with said primary clip member.

4. The pack unit of claim 2, in which said secondary clip member is of sheet-like material shaped to afford a portion at which the secondary clip member is pivotally engaged with said further formation of said primary clip member.

5. The pack unit of claim 2, in which said secondary clip member is of sheet-like material shaped to afford a radially inner bight portion at which the secondary

clip member is pivotally engaged with said further formation of said primary clip member.

6. The pack unit of claim 2, in which said first formation of the primary clip member is an axially extending bore in said inner body portion, said further formation comprising a slot in the primary member paralleling said axes and opening externally of that member, said portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement thereof and of the unit of finishing material carried thereby on said primary clip member.

7. The pack unit of claim 3, in which said first formation of the primary clip member is an axially extending bore in said inner body portion, said further formation comprising a slot in the primary member paralleling said axes and opening externally of that member, said portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement thereof and of the unit of finishing material carried thereby on said primary clip member.

8. The pack unit of claim 4, in which said first formation of the primary clip member is an axially extending bore in said inner body portion, said further formation comprising a slot in the primary member paralleling said axes and opening externally of tha member, said portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement thereof and of the unit of finishing material carried thereby on said primary clip member.

9. The pack unit of claim 5, in which said first formation of the primary clip member is an axially extending bore in said inner body portion, said further formation comprising a slot in the primary member paralleling said axes and opening externally of that member, said bight portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement of the clipped unit of finishing material on said primary clip member.

10. The pack unit of claim 9, in which said bight portion of said secondary clip member has an axially elongated spine element disposed therein.

11. The pack unit of claim 9, in which said bight portion of said secondary clip member has an axially elongated spine element disposed therein, and a sleeve element interposed between said spine element and said bight portion.

12. The pack unit of claim 1, in which the pivotal and releasable engagement of said secondary clip member is at a point radially outwardly of said hub structure, the pivotal engagement of the primary clip member with said structure being a permanent one as compared with said engagement of the secondary clip member.

13. The pack unit of claim 3, in which the pivotal and releasable engagement of said secondary clip member is at a point radially outwardly of said hub structure, the pivotal engagement of the primary clip member with said structure being a permanent one as compared with said engagement of the secondary clip member.

14. The pack unit of claim 5, in which the pivotal and releasable engagement of said secondary clip member is at a point radially outwardly of said hub structure, the pivotal engagement of the primary clip member extrusion with said structure being a permanent one as compared with said engagement of the secondary clip member.

15. A finishing pack unit adapted to be mounted on a hub structure of a rotary type finishing wheel, comprising a primary inner clip member having means for mounting the same on the hub structure, a unit of finishing material, and means replaceably mounting said unit of finishing material on said primary clip member, said last-named means comprising a secondary clip member having an inner portion which is pivotally and releasably engaged with said primary clip member, and means fixedly connecting said secondary clip member to said unit of finishing material at an inner portion of the latter, said secondary clip member being adapted to swing individually on an axis radially outwardly paralleling the rotative axis of the hub structure.

16. The pack unit of claim 15, in which said primary inner clip member includes means adapted to pivotally engage the hub structure.

17. The pack unit of claim 15, in which both of said clip members includes means adapted for pivotally mounting the primary clip member on the hub structure and the secondary clip member on the primary clip member, each of said clip members being adapted to swing individually on an axis radially outwardly paralleling the rotative axis of the hub structure.

18. The pack unit of claim 15, in which said primary clip member is relatively rigid and is provided with a first formation in a radially inner body portion thereof at which said primary clip member is adapted to pivotally engage the hub structure, and a further formation radially outward of said first formation at which said secondary clip member is replaceably engaged with the primary clip member.

19. The pack unit of claim 15, in which said primary clip member is relatively rigid and said secondary clip member is of sheet-like material shaped to afford a portion at which the secondary clip member is pivotally engaged with said primary clip member.

20. The pack unit of claim 18, in which said secondary clip member is of sheet-like material shaped to afford a portion at which the secondary clip member is pivotally engaged with said further formation of said primary clip member.

21. The pack unit of claim 18, in which said secondary clip member is of sheet-like material shaped to afford a radially inner bight portion at which the secondary clip member is pivotally engaged with said further formation of said primary clip member.

22. The pack unit of claim 18, in which said first formation of the primary clip member is an axially extending bore in said extrusion body portion, said further formation comprising a slot in the primary clip member opening externally of that member, said portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement of the clipped unit of finishing material on said primary clip member.

23. The pack unit of claim 21, in which said first formation of the primary clip member is an axially extending bore in said inner body portion, said further formation comprising a slot in the primary member paralleling said axes and opening externally of that member, said bight portion of said secondary clip member having releasable axial sliding engagement in said slot to enable replacement of the clipped unit of finishing material on said primary clip member.

24. The pack unit of claim 23, in which said bight portion of said secondary clip member has an axially elongated spine element disposed therein.

25. The pack unit of claim 23, in which said bight portion of said secondary clip member has an axially elongated spine element disposed therein, and a sleeve element interposed between said spine element and said bight portion.

26. The pack unit of claim 17, in which the pivotal and releasable engagement of said secondary clip member is at a point radially outwardly of the hub structure, the pivotal engagement of the primary clip member with the hub structure being a permanent one as compared with said engagement of the secondary member.

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