Jan. 20, 1953 A. R. TENNY 2,625,774

ROTARY ABRASIVE HEAD

Filed Sept. 23, 1949 2 SHEETS—SHEET 1

Fig. 1.

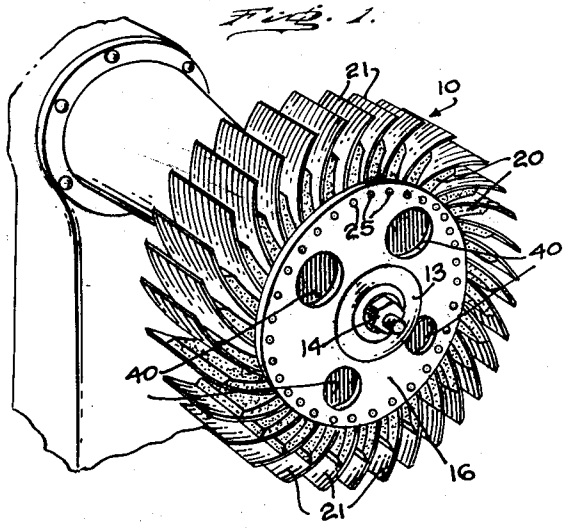


Fig. 3

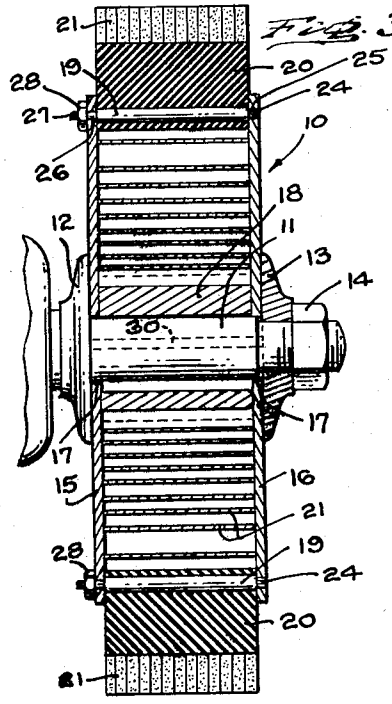


Fig. 2

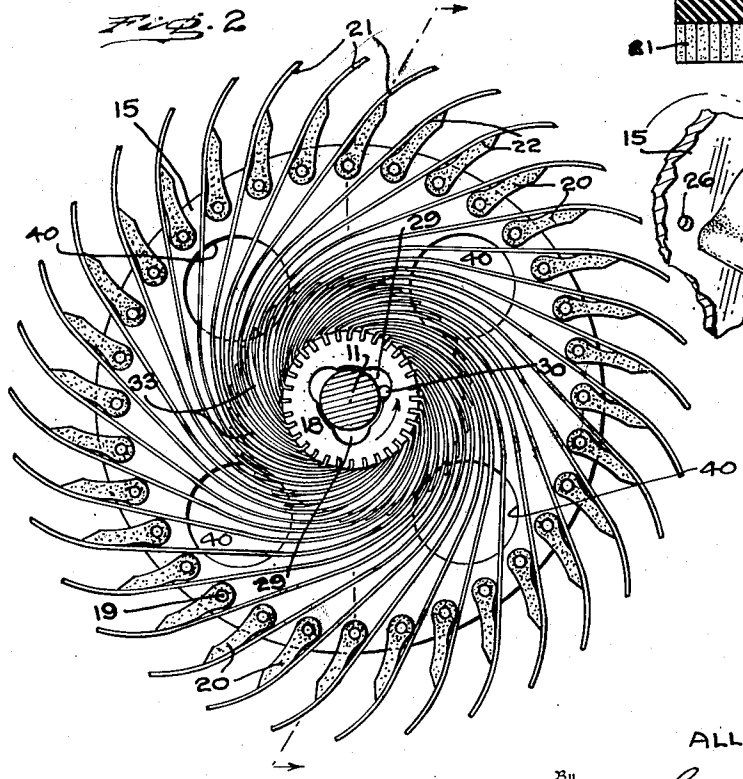
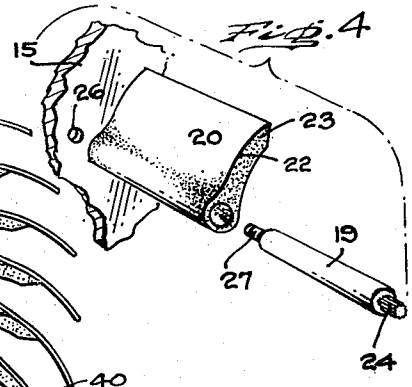


Fig. 4



Inventor

ALLEN R. TENNY

By

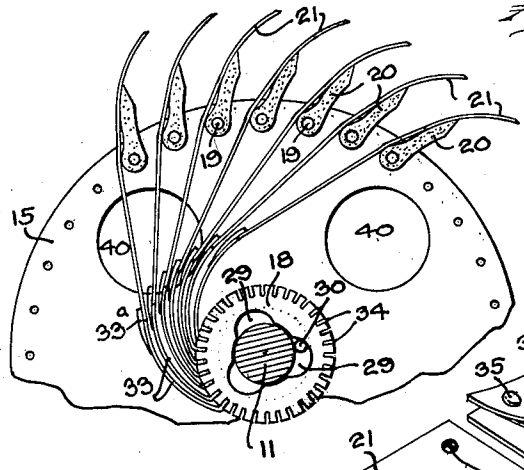
Attorney

Jan. 20, 1953 A. R. TENNY 2,625,774

ROTARY ABRASIVE HEAD

Filed Sept. 23, 1949 2 SHEETS—SHEET 2

Fig. 5



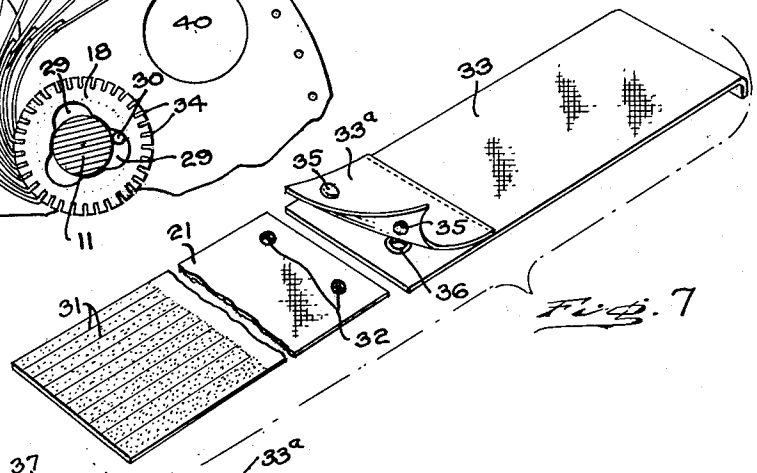


Fig. 7

Fig. 9

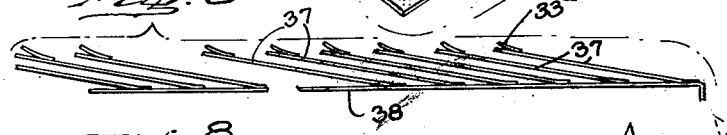


Fig. 6

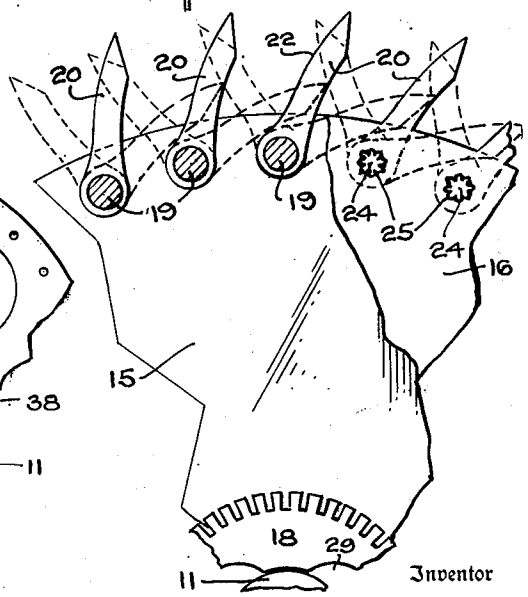
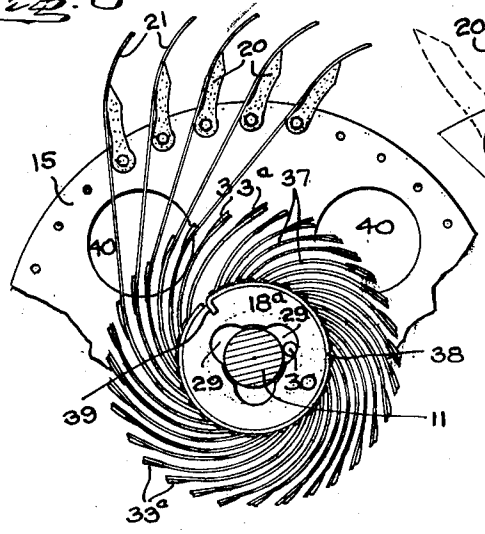


Fig. 8



Inventor

ALLEN R. TENNY

By

Attorney

Patented Jan. 20, 1953 2,625,774

UNITED STATES PATENT OFFICE

2,625,774

ROTARY ABRASIVE HEAD

Allen R. Tenny, Allentown, Pa., assignor to Van Arsdale Corporation, Allentown, Pa., a corporation of Pennsylvania

Application September 23, 1949, Serial No. 117,468

4 Claims. (Cl. 51—193.7)

1

This invention relates generally to surface-finishing apparatus and more particularly to improvements in the design and construction of a motor-driven rotary abrasive head of the type adapted for sanding or surface-smoothing articles having surfaces of irregular contour.

Among the principal objects of the present invention is to provide a rotary sanding or abrasive head having simple and effective means operative to greatly facilitate uniform projection of a plurality of abrasive-coated strips radially of the head to present new abrasive surfaces to replace those worn out in use.

More specifically, it is an object of the present invention to provide a locking pin between the motor spindle and an inner hub of the abrasive head which is operative as a wedge to automatically clutch the hub to the spindle when the head is loosened upon its spindle and the latter is stationary, to thereby permit free rotation of the head relatively to the hub for uniform extension or retraction of the several abrasive-coated strips wrapped about the drum. The arrangement of the clutch means within the rotary head is generally such that merely upon loosening of the head upon its supporting spindle so that it may be rotated relatively thereto, the abrasive strips may be uniformly fed radially from the periphery of the head to the extent desired, thereby eliminating for such purpose the necessity of dismantling the head or the use of special tools.

A still further object of the present invention is the provision in a rotary abrasive head of the character above described of a plurality of circumferentially spaced, radially projecting buffer blocks of resilient, shock-absorbing material, such as rubber, felt or the like, adjoining pairs of which define slots therebetween through which the abrasive strips extend radially of the head, these blocks being so adjustably mounted in the head as to provide for desired angular disposition thereof relatively to the peripheral surface of the head for support of the freely extended abrasive surfaces in suitably adjusted position with respect to the work, thereby rendering the head readily adaptable to different work requirements.

Still another and important object of the present invention is to provide an improved arrangement for securing the abrasive strips to the inner drum and for facilitating replacement of the strips when the abrasive surfaces thereof are worn away, the arrangement being such as to make possible not only the utilization of abrasive-coated strips to the full extent of their respective lengths but also the securement of the strips to

2

and their removal from the head without the necessity of completely dismantling or even dismounting the head from its supporting spindle.

A still further object of the invention is to provide the rotary head with means for effecting positive circulation of air therethrough during operation of the head, the air being so directed through the head and over the abrasive surfaces of the radially extending abrasive-coated strips as to not only hold the same in operative position and against any tendency to flutter or flap, but also to air-cool the abrasive surfaces with consequent improvement in the grinding action thereof.

Other objects and advantages of the invention, such as those relating to economies obtained in the manufacture of the head, as well as those resulting from the use thereof, will appear more fully hereinafter, it being understood that the present invention consists substantially in the combination, construction, location and relative arrangement of parts, all as shown in the accompanying drawings, as described in detail in the following specification and as finally pointed out in the appended claims.

In the accompanying drawings which are illustrative of certain preferred embodiments of the present invention:

Figure 1 is a perspective view showing the head mounted upon a motor-driven spindle therefor;

Figure 2 is an elevational view of the abrasive head with its outer face plate removed to show the inner drum with its full complement of abrasive strips;

Figure 3 is a vertical sectional view as taken substantially on the line 3—3 of Figure 2;

Figure 4 is a view showing in perspective one of the resilient buffer blocks and its supporting pin;

Figure 5 is a partial elevational view of the abrasive head with its outer face plate removed showing the inner drum clutched to the stationary spindle upon rotation of the head in clockwise direction;

Figure 6 is a partial elevational view of the head on a somewhat enlarged scale, illustrating the permissible adjustment of the buffer blocks angularly about their supporting pins;

Figure 7 is a perspective view of an abrasive strip assembly including the abrasive strip per se and its anchoring element;

Figure 8 is a view similar to Figure 2 but showing a modified arrangement for anchoring the abrasive strips to the inner drum; and

Figure 9 is an edge elevational view of the

modified form of abrasive strip assembly such as is employed in the arrangement of Figure 8.

Referring now more particularly to the drawings, it will be observed that the abrasive head of the present invention, designated generally by the reference numeral 10, is adapted to be mounted upon the rotating spindle 11 of a motor driven unit of any conventional type, the head being removably clamped upon the spindle between a pair of end-thrust members 12—13, the inner member 12 being suitably secured in axially fixed position upon the spindle to provide a fixed abutment engageable by the inner face of the head while the outer member 13 is pressed against the outer face of the head by a lock nut 14 threaded upon the outer end of the spindle.

The abrasive head 10 is itself formed of a plurality of readily separable interengageable parts which are adapted to be secured together in relatively immovable assembled relation upon the spindle 11 by the opposed end-thrust members 12—13, the general arrangement being such that when the head is clamped in operative position upon the rotatable spindle the several component parts of the head rotate as a unit with the spindle.

Essentially, the head 10 embodies a pair of opposed equidiameter circular face plates 15 and 16 respectively provided with central openings 17—17 of a size adapted to snugly receive the spindle 11 projected therethrough, these opposite face plates being maintained in spaced, parallel relation by an inner drum member or hub 18 having a slip fit on the spindle 11, the member 18 being of such axial dimension or thickness as to enable it to be securely clamped to and between the face plates 15 and 16 when the nut 14 is tightened upon the spindle against the end thrust member 13. When the nut 14 is so tightened the face plates 15 and 16 and the central hub member 18 embraced thereby are secured to and rotate as a unit with the spindle 11.

Extending between the face plates 15 and 16 immediately adjacent their peripheral edges are a plurality of circumferentially spaced pins 19, each of which is fitted with a buffer block 20 formed of rubber, felt or other such resilient material. As most clearly appears in Figure 4, these buffer blocks are each of a width substantially equal to the axial spacing between the face plates 15 and 16 and are each preferably cemented or otherwise firmly secured to its supporting pin 19.

The buffer blocks 20 are relatively so disposed as to present the proximate surfaces of each adjoining pair thereof in spaced, substantially parallel relation, each such pair of blocks thus providing a passageway therebetween through which may be projected the outer end of a strip 21 of the abrasive-coated material, the inner end of such strip being suitably anchored to the central hub member 18 of the head as will presently appear. It will be noted that the buffer blocks 20 are respectively formed in longitudinal section to provide an arcuately shaped surface 22 for support of the overlying abrasive strip 21, the outer edge portion of each block being preferably feathered, as at 23, to not only increase the resiliency of the block in the region of its extremity, but to also permit overlapping of the buffer block extremities when the blocks are pressed inwardly under the working load applied to the abrasive strips respectively overlying the blocks.

In certain cases it may be desirable to operate the head with the several abrasive strips extending radially thereof and in circumferentially spaced relation, while in other cases it may be desirable to operate the head with the several abrasive strips disposed in substantially overlapping relation to provide in effect a continuous, circular grinding surface concentric with the peripheral edge of the rotary head. Generally speaking, the former arrangement of the abrasive strips is employed for light work, as for buffing of intricate irregular surfaces, while the latter arrangement is most desirable for heavier work, as where it is necessary to remove stock from a piece of work having a more or less regular surface. In order to adjust the head for such light or heavy grinding duty, it is merely necessary to angularly adjust the buffer blocks 20 relatively to the peripheral surface of the head. For this purpose, each pin 19 is splined at one or both ends thereof, as at 24, for non-rotatable seating with correspondingly shaped openings formed in the face plates 15—16.

In the particular arrangement shown, the opposite ends of the pins 19 are reduced for respective projection through suitable openings 25—26 respectively formed in the face plates 15—16, the outer reduced ends thereof being splined, as at 24, while their inner reduced ends are threaded, as at 27, to respectively receive nuts 28 for securement of the pins to the inner face plate 16. It will be apparent that any desired angular adjustment of the buffer blocks may be effected by suitably seating the splined ends of the pins 19 in the spline-receiving openings 25 formed in the outer plate 16, which latter then serves to hold all of the pins in their angularly adjusted positions. Figure 6 illustrates three such adjusted positions of the buffer blocks, one position being shown in full lines and the other two in dotted lines.

As most clearly appears in Figures 2 and 5, the central inner drum or hub 18, which is clamped between the face plates 15 and 16 and to the spindle 11 for rotation therewith as a unitary assembly, is provided with one or more semi-circular grooves or recesses 29 extending through the hub in parallel relation to its axis, these recesses being in communication with the central bore of the hub. Loosely fitted in any one of the recesses 29 is a floating lock pin 30 of a length equal to the axial length of the hub 18, this lock pin 30 being adapted to bear against the spindle 11 and one or the other of the oppositely inclined surfaces of the recess 19 to clutch the hub against clock-wise or counter-clock-wise rotation thereof relatively to the spindle 11. Thus, as appears in Figure 2 when the spindle 11 is stationary and the spindle nut 14 loosened to permit free rotation of the face plates 15 and 16 and their intervening buffer blocks 20 as a unit in the counter-clock-wise direction of the arrow shown on the hub 18, the clutch pin 30 shifts into its position as shown to lock the hub 18 against any corresponding rotation relatively to the spindle 11. Likewise, when the face plate and buffer block assembly is rotated clockwise relatively to the stationary shaft, the clutch pin 30 shifts into its position shown in Figure 5 to lock the hub 18 against corresponding rotation relatively to the spindle 11. The clutch pin 30 in association with the inner hub 18 thus provides an exceedingly effective means for extending or retracting the strips of abrasive-coated material relatively to their supporting buffer blocks 20, all as will presently appear.

At this point it will be noted that the strips 21 of abrasive-coated material are of the form most clearly shown in Figure 7, each such strip consisting of a longitudinally extending web of flexible material suitably coated upon one surface thereof with comminuted particles of a suitable abrasive, such as silicon carbide, aluminum oxide, sand, steel or the like. The strips 21 are preferably longitudinally slashed, as at 31, for their major length, the unslashed end portions thereof being provided with a pair of laterally spaced perforations 32.

The strips 21 are respectively secured to the inner hub 18 by means of flexible anchoring extensions 33 formed of suitably strong material, such as buckram, canvas or even thin sheet metal, the inner ends of which are respectively suitably secured in circumferentially spaced slots 34 formed in the peripheral surface of the central hub 18. The outer free ends of these flexible strip-anchoring extensions 33 are provided with any suitable quick-detachable fastener elements adapted for projection through the perforations 32 of the abrasive-coated strips 21 for securement of the latter to the anchoring elements as extensions thereof. Preferably, as shown in Figure 7, the free ends of the anchoring extensions 33 are each provided with an overlying flap 33^a, the flap 33^a and the underlying portion of the extension 33 being respectively fitted with male and female snap-fastener elements 35—36 which coact to secure the perforated end of the abrasive strip 21 between the free end of the anchoring extension 33 and its overlying flap 33^a.

As shown in Figures 2 and 5, the several abrasive strips 21 are anchored to the hub 18 by separate anchoring extensions 33 individually secured to the hub, the strips 21 as anchored to the hub being each of a length adequate to permit the same to be wrapped about a substantial portion of the hub periphery and then extended radially outwardly of the rotary head through the passageway formed between an adjoining pair of the buffer blocks 20.

In the modified arrangement shown in Figures 8 and 9, the several abrasive strips 21 are respectively secured to separate anchoring extensions 37 which are individually secured, in the form of overlapping leaves arranged in longitudinally spaced relation, to a single flexible anchoring web 38 of a length sufficient to extend completely about the peripheral surface of the hub 18^a with its inner end secured, as at 39, within a single slot formed in said hub. The several extensions 37 are thus spaced circumferentially about the hub and serve as anchoring extensions for securing the strips 21 in uniformly spaced relation about the hub, the strips 21, being respectively secured to the leaf extensions 37 by substantially the same means employed for securing them to the individually anchored extensions 34 of Figures 2 and 5. It will be understood, of course, that the strips 21 may be secured to their respective anchoring extensions (33 or 37) by any suitable quick-detachable fastening elements other than those herein specifically mentioned.

It will be understood that for normal operation of the rotary abrasive head, the lock nut 15 is tightened upon the spindle 11 to thereby securely lock the head operatively upon the spindle with the several abrasive strips 21 thereof projecting radially through the several passageways provided between the buffer blocks 20. Upon rotation of the head at its normal operative speed, the slack portions of the abrasive strips are drawn

taut by centrifugal force, the freely projecting tips of the abrasive strips being thus maintained exposed for yielding contact with the surfaces of the work to be smoothed or polished. As the abrasive surfaces of the exposed portions of the strips become worn, additional portions may be brought into use by radially extending the same outwardly of the rotary head.

In order to so radially extend the abrasive strips outwardly of the head, it is merely necessary to loosen the lock nut 14 upon the spindle 11 to thereby permit free rotation of the face plates 15 and 16 and their intervening buffer blocks 20 as a unit about the spindle 11 in the direction of normal operating rotation of the head, this direction being counterclockwise when the head is viewed, as in Figures 1 and 2. Upon so rotating the loosened head about the stationary supporting spindle 11, the inner drum or hub member 18 will be locked to the spindle by means of the clutch pin 30 becoming wedged between the spindle and the inclined surface of the recess 29, as shown in Figure 2, thereby maintaining the hub 18 stationary, while permitting rotation of the face plates relatively thereto in counterclockwise direction. It will be apparent that by reason of such movement of the face plates and intervening buffer blocks as a unit relatively to the stationary inner hub member 18, the several strips 21 will be fed radially outward of the head between adjoining pairs of the buffer blocks, the extent of such outward projection of the strips being, of course, dependent upon the degree of rotation of the loose head relatively to the spindle and the hub 18 locked thereto. When the desired outward projection of the strips is obtained, the lock nut 14 is retightened upon the spindle 11 whereby to again clamp the hub 18 securely between the face plates, the entire assembly being then rigidly secured to the spindle for rotation therewith.

Should it be desired to retract the several strips 21 from their radially extended positions, the lock nut 14 is loosened and the face plates 15—16 with their intervening buffer blocks 20 are then rotated as a unit in the direction opposite the normal rotating direction of the head, that is, in clockwise direction as viewed in Figures 1 and 2, whereupon the several strips are wrapped about the inner hub member 18 with consequent retraction of the strips. It will be understood, of course, that upon suitable adjustment of the strips radially outward of the rotary head, the lock nut 14 is always tightened upon the spindle 11 to maintain the strips in their adjusted position. It will also be apparent that by means of the adjustment as just described, either for projecting outwardly or retracting inwardly the several strips, all of the latter are uniformly adjusted relatively to the peripheral surface of the head. Should it be desired to operate the head as a continuous belt type buffer or grinder, the buffer blocks 20 may all be angularly adjusted relatively to the face plates 15—16 into the overlapping relation shown in dotted lines in Figure 6, thereby causing the outwardly extended portions of the abrasive strips 21 to more or less overlie one another and so provide in effect a continuous abrading surface.

As the strips 21 of the abrasive coated material are fully worn out in use, they may be readily replaced by fresh strips which are respectively quick-detachably secured to their anchoring extensions 33 (or 37) as hereinbefore described. By forming these anchoring extensions each of a length sufficient to permit their outer ends to be

freely extended through and radially outwardly of the passages formed between adjoining pairs of the buffer blocks 20, the abrasive strips 21 may be secured to or detached from their respective anchoring extensions without the necessity of disassembling the head or of demounting it from its supporting spindle. Inasmuch as the anchoring extensions 33 (or 37) are not coated with abrasive, there is no waste of any of the relatively expensive abrasive coated material, all of the latter being confined exclusively to the detachable strips 21 which are adapted to be entirely consumed prior to reloading the head with a fresh supply thereof.

While these abrasive coated strips 21 are shown in the drawing as being longitudinally slashed to provide each strip with a series of ribbon-like elements, it will be understood that these strips may be of solid form (not shown), the choice depending upon the nature of the work to be performed. The buffer blocks 20 are preferably formed of suitable resilient material, such as, rubber, felt, rubber and fabric, or the like, and are cemented, vulcanized or otherwise securely attached to supporting pins 19. The buffer blocks provide yielding and yet substantial backings for the abrasive strips and so permit the latter to radially conform to the contours of the work surfaces to be smoothed or finished. Because the blocks yield individually under pressure of the work applied against the overlying abrasive strips, they exert a stabilizing influence upon the strips and minimize loose play and fluttering thereof during operation of the head.

In order to further minimize fluttering of the outwardly extending portions of the abrasive strips, the face plates 15 and 16 may be provided with a series of openings 40 by way of which air is drawn into the interior of the head during rotation thereof, such air being then forced outwardly of the rotating head by way of the passages formed between adjoining pairs of the buffer blocks 20. The rotating head with its apertured face plates thus serves in the nature of a pump to force air over the work-engaging surfaces of the abrasive strips and so hold the latter in intimate contact with its associated supporting buffer block. The air which is so forced over the abrasive surfaces of the strips 21 also serves as a coolant for such surfaces and so improves the grinding action of the head.

It will be understood, of course, that the present invention is susceptible of various changes and modifications which may be made from time to time without involving any departure from the general principles or real spirit thereof, and it is accordingly intended to claim the same broadly, as well as specifically, as indicated in the appended claims.

What is claimed as new and useful is:

1. A rotary abrasive head adapted to be mounted upon a rotatable spindle and comprising a pair of axially spaced end plates rotatably fitted on said spindle, a hub member disposed between said end plates and also rotatably fitted on said spindle, means for nonrotatable locking said plates and hub member together on said spindle for rotation as a unit therewith, a plurality of abrasive-coated strips embraced between said plates with their inner ends respectively anchored to said hub member and their outer ends projecting externally of the head at points spaced circumferentially about its periphery, and wedge means interposed between said hub member and said spindle operative, when said spindle is held stationary and said plates are loosened for rotation relatively thereto, to lock said hub member to said stationary spindle and thereby permit angular displacement of the plates relatively to the hub member to vary the extent of projection of the strips outwardly of the head.

2. A rotary abrasive head adapted to be mounted upon a rotatable spindle and comprising a pair of axially spaced end plates, a coaxial hub member adapted to be clamped between said plates for rotation therewith, a plurality of flexible webs embraced between said plates with their inner ends respectively fixedly anchored in said hub member and their outer ends free of the latter for extension of said webs outwardly toward the periphery of said head, said webs being each of a length sufficient to locate their free ends in proximity to the peripheral surface of the head for access to said ends from outside of said head, a plurality of abrasive-coated strips, means carried by the ends of said webs cooperating with the strips to freely detachably secure said strips respectively to the free ends of said webs, said strips projecting externally of the head at points spaced circumferentially about its periphery, and means operable externally of the head for effecting adjustment of said strips into and out of said head.

3. A rotary abrasive head adapted to be mounted upon a rotatable spindle and comprising a pair of axially spaced end plates, a coaxial hub member adapted to be clamped between said plates for rotation therewith, a plurality of flexible webs embraced between said plates with their inner ends respectively fixedly anchored in said hub member and their outer ends free of the latter for extension of said webs outwardly toward the periphery of said head, said webs being each of a length sufficient to locate their free ends in proximity to the peripheral surface of the head for access to said ends from outside of said head, a plurality of abrasive-coated strips, means carried by the ends of said webs cooperating with the strips to freely detachably secure said strips respectively to the free ends of said webs, said strips projecting externally of the head at points spaced circumferentially about its periphery, and means for simultaneously adjusting the strips relatively to the drum for varying the extent to which they project externally of the head, said strips being respectively securable to or removable from the anchoring webs upon extension of the latter into positions presenting their outer ends at the peripheral surface of the head.

4. A rotary abrasive head comprising a pair of axially spaced end plates, a hub member coaxial with said plates and adapted to be clamped therebetween for rotation therewith, an annular series of resilient buffer blocks anchored between the marginal edges of said plates and projecting radially outward thereof, said blocks being circumferentially spaced about the periphery of the head to provide a series of passageways therebetween, a plurality of abrasive-coated strips having their inner ends respectively anchored to said hub member and their outer ends respectively projecting outwardly of the head through said passageways and means for angularly adjusting said blocks in respectively fixed positions relatively to the periphery of the head to vary the extent of overlap of the blocks relatively to one another, said last-mentioned means including individual supporting rods for the several buffer blocks having splined ends adapted to

be nonrotatably fitted in complementally shaped openings in at least one of said end plates.

ALLEN R. TENNY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
564,587	Black	July 28, 1896
674,384	Nash	May 21, 1901
2,100,780	Huhn	Nov. 30, 1937
2,125,460	Plingemeier	Aug. 2, 1938
2,194,577	Vonnegut	Mar. 26, 1940
2,192,804	Schulte	Mar. 5, 1940
2,430,099	Bradley	Nov. 4, 1947
2,439,962	Bonkowski	Apr. 20, 1948
2,452,409	Wickman	Oct. 26, 1948
2,522,920	Baltes	Sept. 19, 1950