United States Patent [19]

Samuels

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[54] **PAPER SHREDDER**

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[52] **U.S. Cl.** **241/236**

[51] **Int. Cl.** **B02c 7/04,** B02c 7/12

[58] **Field of Search** 241/221, 227, 235, 236, 241/243, 282.1

[56] **References Cited**

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3,396,914	8/1968	Leibman	241/236 X
3,630,460	12/1971	Goldhammer	241/236

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[57] **ABSTRACT**

A shredding device for paper and other material capable of being torn having a pair of oppositely rotating rolls, each with a plurality of circular discs thereon axially spaced apart along the length thereof is provided wherein the discs on one roll are received within the spaces between discs on the other roll and spaced from the faces thereof, and one circumferential edge of certain ones or all of said discs has a radius to cooperate with sharp circumferential edges on an adjacent disc thereby tearing and shredding the material. Comb teeth are located in the spaces between adjacent discs and are floatingly mounted to prevent jamming of the material being shredded.

6 Claims, 5 Drawing Figures

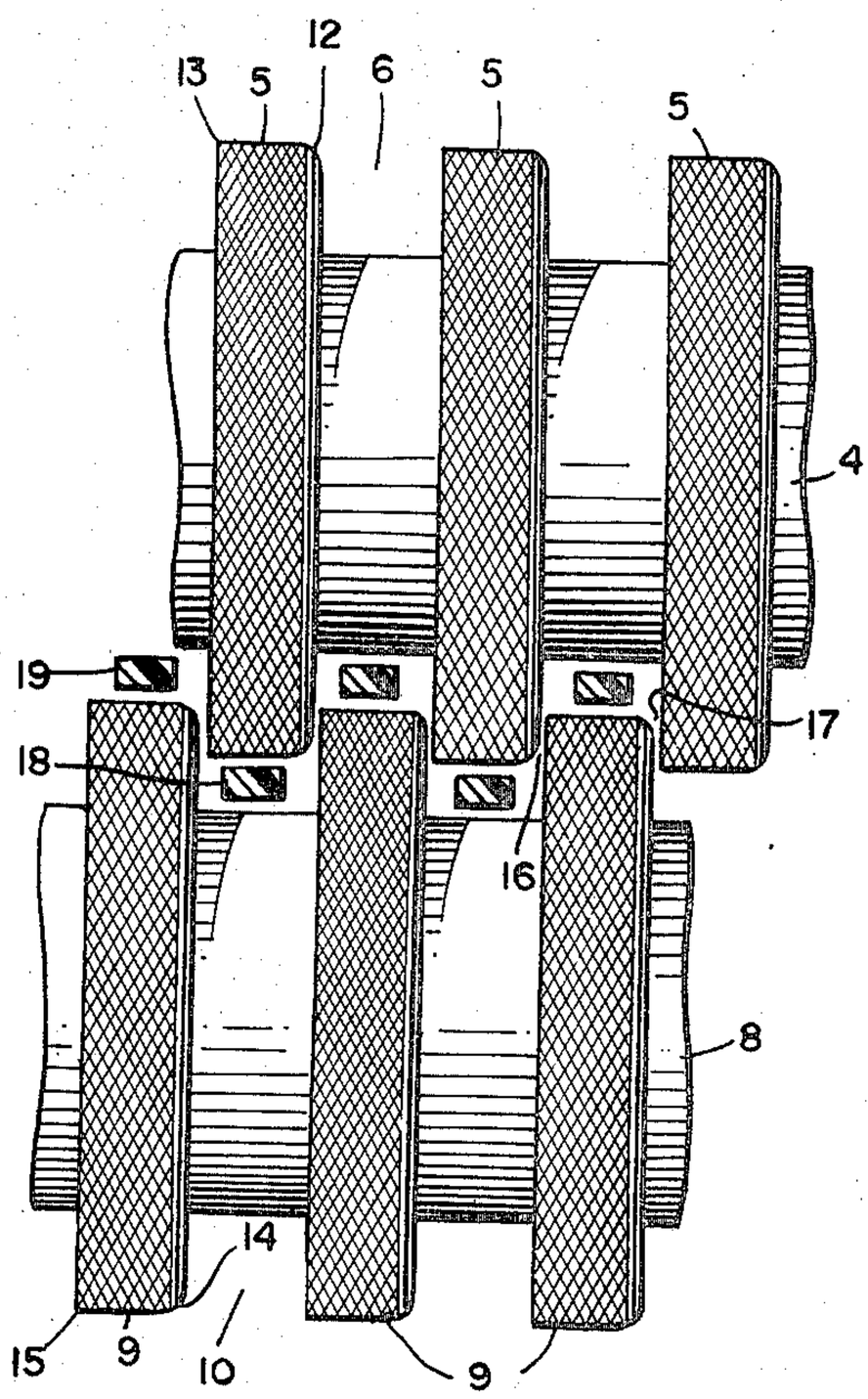


FIG. 1

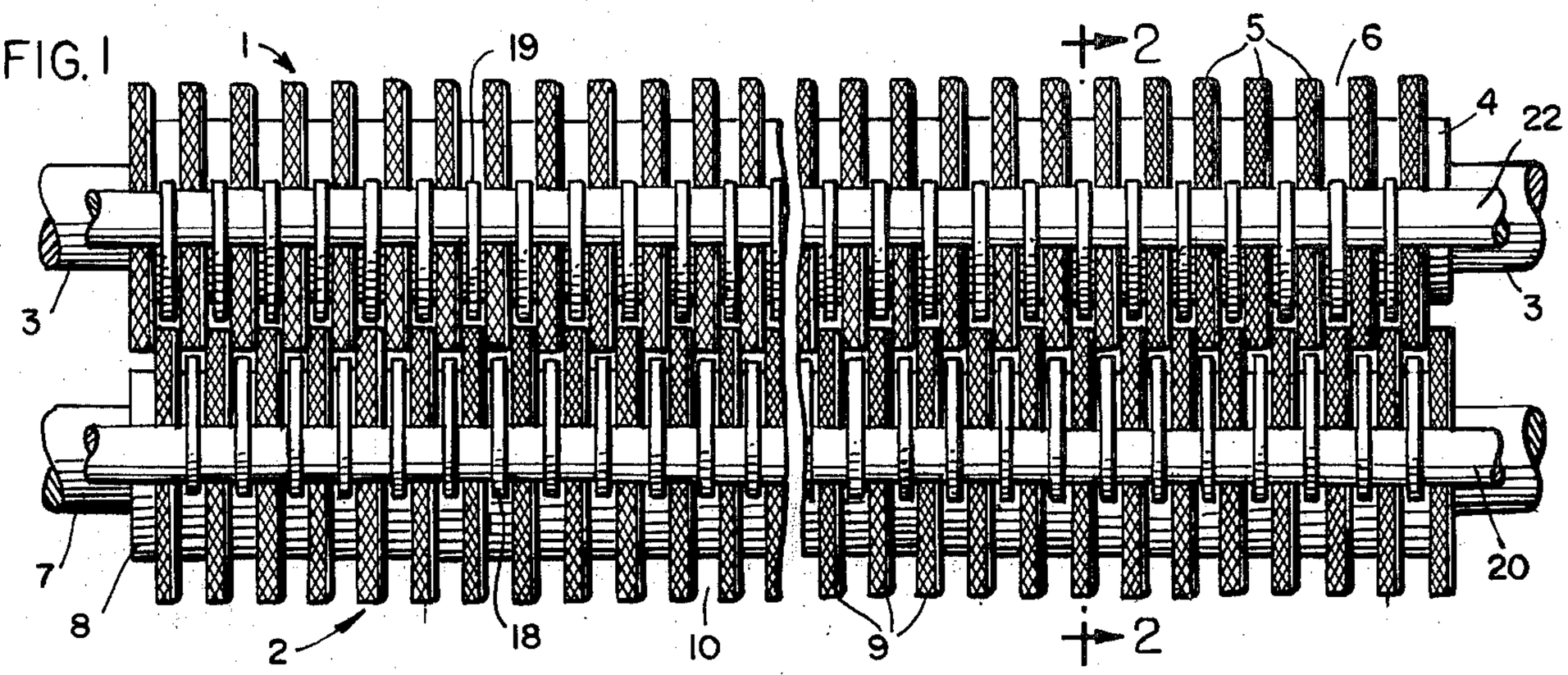


FIG. 2

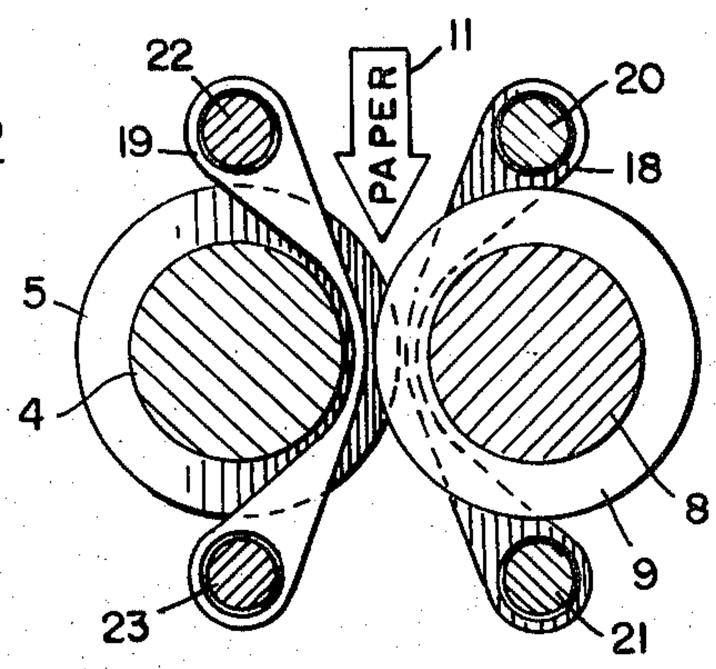


FIG. 5

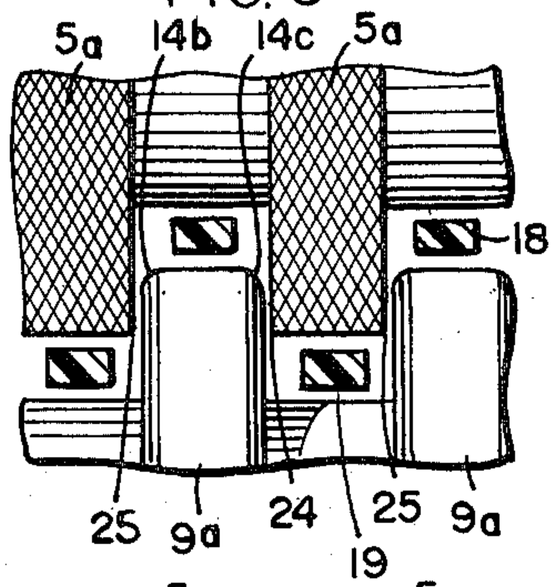


FIG. 3

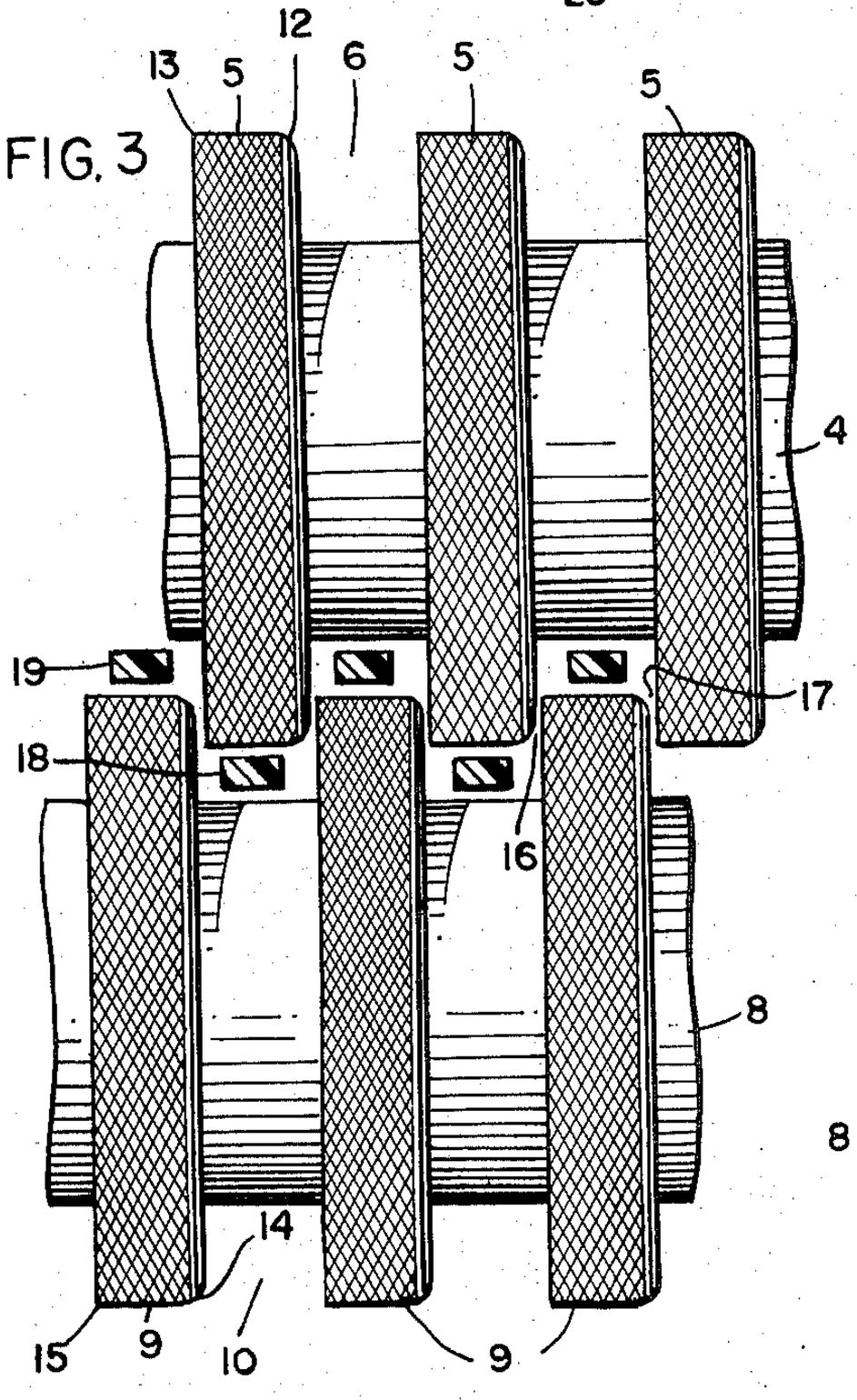
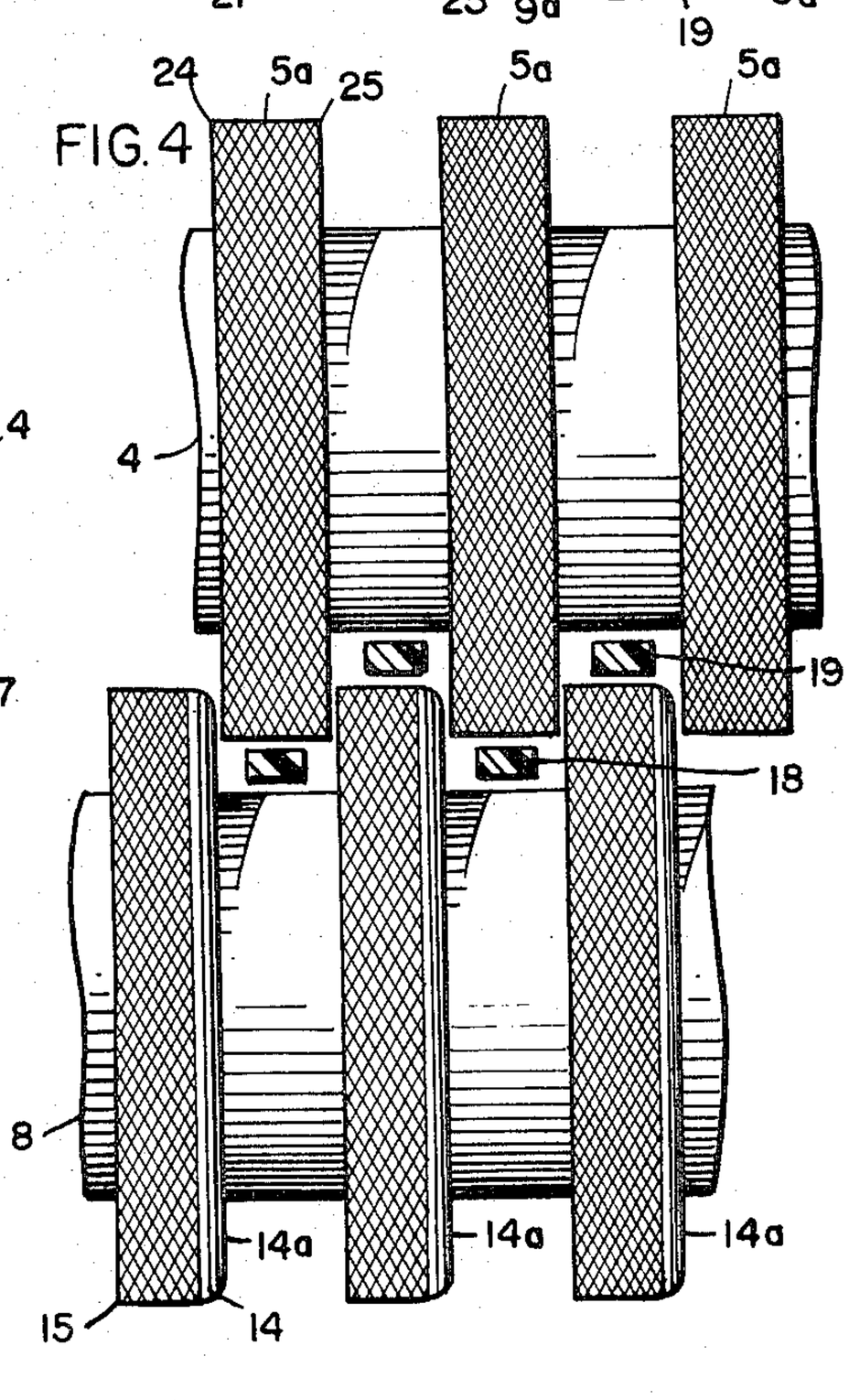


FIG. 4



PAPER SHREDDER

BACKGROUND OF THE INVENTION

The invention relates in general to shredders, and particularly to shredders for shredding paper and other materials capable of being torn and thereby shredded. Apparatus for accomplishing such results have heretofore been known, but such apparatus have had certain disadvantages and limitations relating to the capacity thereof as well as the efficiency. For example, British Patent No. 1,002,799 shows the use of parallel rolls each having external threads intermeshing with similar external threads on the other roll, and each thread having a single edge at its circumference. This device has a relatively small capacity and functions poorly, especially on narrow widths of material, because the circumference of one set of threads merely causes a fold in the material while the other set is spaced to stretch the material to tear it, but such design has only a limited stretching effect and is, therefore, inefficient.

These aforesaid shortcomings of prior art devices have been recognized and attempts have been made to improve the efficiency and capacity thereof as illustrated, for example, by the disclosure in U. S. Pat. No. 3,630,460. This latter attempt at improvement has been made by providing discs on rolls wherein each disc has parallel side faces and a thickness thereby permitting two circumferential sharpened edges. This is said to increase the shredding efficiency, but this and the capacity of such apparatus is still a problem, particularly where use is made of a comb of a rigid type heretofore known having rigid teeth positioned between the discs on each roll.

SUMMARY OF THE INVENTION

Accordingly, it is a principal object of the present invention to provide a new and improved device for shredding paper and other material capable of being torn and thereby shredded as distinguished from being cut.

A further object is to provide a shredding device wherein at least one circumferential edge of the shredding discs on at least one of the rolls is rounded and thereby provided with a radius, and which is positioned in assembled relation with the other roll so that the edge with the radius is positioned adjacent the face of a disc on the other roll, the circumferential edge of which is sharp.

Another object of the invention is to provide a shredding device wherein spaced shredding discs on one roll are received between spaced shredding discs on a cooperating roll, and comb teeth are floatingly mounted between the discs of each roll, thereby to enable an increase in the thickness of material being shredded without jamming.

Briefly, the invention comtemplates a pair of rolls, each having a plurality of shreddng discs spaced along the length thereof with each disc of one roll extending into the space between the discs on the other roll, with each disc having two circumferential edges around its periphery, and wherein at least one of such circumferential edges of each disc on at least one of the rolls has a radius. Preferably the discs are arranged so that the circumferential edge having the radius on one disc is positioned adjacent the face of a disc on the other roll which has the circumferential edge which is sharp. A number of combinations may be had to satisfy this latter condition and will be illustrated and described hereinafter.

Another feature of the invention is the provision of a comb for each roll, the teeth of which are positioned in the spaces between adjacent discs, and wherein such teeth are floatingly mounted and are preferably resilient so that a greater thickness of material can be shredded in an efficient manner than has been possible heretofore.

DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a pair of rolls having shredding discs thereon and combs associated therewith in accordance with the present invention;

FIG. 2 is a transverse sectional view taken substantially along the plane of line 2—2 of FIG. 1;

FIG. 3 is a fragmentary enlarged plan view of the shredding rolls illustrating one form of the invention and showing the comb teeth in section;

FIG. 4 is an enlarged fragmentary view similar to FIG. 3 but showing a modified form of the invention; and

FIG. 5 is a view similar to FIGS. 3 and 4 but showing a still further modified form of the invention.

DETAILED DESCRIPTION

Referring now more particularly to the drawing, and especially to FIG. 1, there is illustrated a pair of shredding rolls indicated generally by the numerals 1 and 2. The roll 1 comprises an elongated shaft 3 which preferably has an axially extending enlarged portion 4 on which a plurality of shredding discs 5 are mounted. These discs 5 are spaced apart axially along the length of the shaft 3 resulting in the spaces 6.

The other roll 2 has a shaft 7 with an enlarged portion 8 thereon on which is mounted a plurality of shredding discs 9, also in spaced apart relation thereby providing the spaces 10 therebetween.

The discs 5 are positioned so that the peripheries thereof are received within the spaces 10 on the companion roll. Likewise the discs 9 are received in the spaces 6 on the other roll. The outer peripheries of the two sets of rolls thereby overlap in a well known manner and as shown in FIG. 2. The peripheral surfaces of both sets of discs are preferably provided with friction means so that when paper or other material capable of being stretched and torn is placed in between the rolls as indicated by the arrow 11 the discs will grasp the material and pull it downwardly between the rolls. The friction surface may be provided by any one of a number of ways. For example, each peripheral surface can be provided with axially extending teeth or ribs, or it can be knurled, or a suitable friction substance can be applied thereto. Providing such shredding discs with a friction surface is not novel, and forms no part of the present invention, and, therefore, need not be illustrated nor described in any greater detail.

The discs on one roll are not only received in the spaces on the other roll, but also the two sets of discs are positioned in axially spaced apart relation. This is necessary to enable the material being shredded to have sufficient room to pass between the rolls when it is being subjected to the tearing and shredding process.

Referring now more particularly to FIG. 3, the discs 5 are shown more clearly as being received in the

spaces **10**, and the discs **9** are shown as being received within the spaces **6**. Each disc on its peripheral surface has two circumferential edges. In FIG. **3** the discs **5** are shown as having such circumferential edges **12** and **13**. Likewise, the discs **9** are shown as having the circumferential edges **14** and **15**. It is likewise clear from FIG. **3** that each of the discs on one roll is spaced from both faces of the discs on the other roll between which it is located. For example, the discs **5** within the spaces **10** have their side faces spaced from the adjacent discs **9** so as to provide the spaces **16** and **17**. It has been found in actual practice that the spaces **16** and **17** are preferably on the order of .006 inches, although this distance may be varied within desirable limits.

A feature of the present invention is the rounding of at least one of the circumferential edges of some or all of the discs on one or both of the rolls thereby providing a radius. For example, in FIG. **3** it will be noted that the circumferential edge **12** of the discs **5** has a radius, whereas the opposite circumferential edge **13** is relatively sharp. Likewise, the circumferential edges **14** on the discs **9** have a radius, whereas the circumferential edges **15** are likewise relatively sharp.

It has been found in actual practice that providing a radius on one of the circumferential edges of a disc creates a sufficient amount of additional space between that edge and the face of the adjacent disc on the other roll so that the capacity of material to be shredded may be increased.

If the radius of the circumferential edges **12** and **14** is too small, then the adjacent space between that edge and the adjacent face of the next disc will be so small that no advantage will be gained by having an edge with a radius. It is likewise true that if the radius is too large, then the tearing and stretching ability of that side of the disc will be impaired. It has thus been determined in actual practice that the radius of these edges should not be greater than approximately 0.010 inches.

Shredders of this type heretofore known have been unable to accommodate more than a few sheets of thin paper at one time, and if more than such maximum number of sheets is placed within the rolls they will become jammed and the motor will stall. While the material most commonly used to be shredded will be paper, it is, of course, understood that other material capable of being stretched and torn may also be shredded in this apparatus. Paper is normally considered to have a thickness anywhere from 0.003 to 0.012 inches. In actual tests of the present machine as many as twelve sheets of paper having a thickness of 0.003 inches have been successfully shredded at one time. Another feature of the invention is the provision of combs associated with each of the rolls, the teeth of which are floatingly mounted and which are preferably made of a resilient material. The teeth of the comb associated with roll **1** are indicated by the numeral **18**, and similar teeth associated with the roll **2** are indicated by the numeral **19**. The configuration of these teeth may be seen by referring to FIG. **2**. The teeth **18** are mounted on the upper and lower supporting rods **20** and **21** suitably supported in the framework of the device. The teeth **19** are similarly mounted on the upper and lower support rods **22** and **23**.

As may also be seen in FIG. **2**, the upper and lower ends of each of the teeth **18** and **19** are provided with openings to receive the respective support rods, and such openings in the teeth have diameters slightly larger than the diameters of the rods upon which they are mounted.

When in completely assembled relation, the teeth **18** and **19** are free to move axially along their respective support rods, and they are likewise capable of a slight movement in a transverse direction toward the enlarged portions of their associated shafts **3** and **7**.

These combs are necessary to prevent the material being shredded from jamming or being wound around one or the other roll during the shredding process. The use of such combs for this purpose is not novel, but heretofore the teeth have been made of a relatively rigid or stiff material and have been rigidly supported so that if material in excess of the capacity of the device is inserted between the rolls such teeth have been known to break. The teeth of the present invention are preferably formed of a resilient material such as a suitable plastic, and this fact in combination with the loose mounting of the teeth on their respective support rods enables a freedom of movement of the individual teeth not heretofore possible, and enables a greater capacity while at the same time properly functioning to prevent jamming.

As mentioned hereinabove, the basic concept of the present invention is capable of assuming alternative forms. The basic concept is the provision of at least one circumferential edge of each disc on at least one roll with a radius. It is desirable to have the face of the disc which terminates at its circumferential edge in a radius adjacent the face of a disc on the other roll the face of which terminates in a circumferential edge which is not radius. With this in mind then reference is next made to FIG. **4** which shows an alternative form of the invention.

In this instance the shaft **7** having the enlarged portion **8** thereon is provided with the same discs **9** with spaces **10** therebetween and the one circumferential edge **14** thereof having a radius. In this case, however, the discs **5***a* on the other roll do not have any circumferential edge with a radius. Such edges **24** and **25** will be relatively sharp, but even in this case it will be noted that the faces **14***a* of the discs **9** which terminate in the circumferential edges **14** having a radius will be positioned adjacent the faces of the discs on the other roll which terminate in circumferential edges which are sharp or at least do not have a radius.

Referring now to FIG. **5**, one of the rolls such as the roll **1** may still have the discs **5***a*, neither edge of which has a radius, but with the other roll having discs thereon **9***a* wherein both of the circumferential edges **14***b* and **14***c* both have a radius.

A further advantage, which results from the construction hereinabove described, wherein at least one of the circumferential edges of the discs on at least one of the rolls has a radius is to facilitate the assembly of the combs on that particular roll. Where the comb teeth are rigidly mounted in a predetermined spaced apart relation this fact is of little consequence, but where such teeth are loosely mounted on their support rods the rounding of the circumferential edges as aforesaid materially aids in aligning the teeth with their respective spaces and in inserting the teeth therein.

From the foregoing description it will be evident that an improved shredding device has been provided which minimizes jamming, and which has increased the capacity thereof beyond that which has been possible heretofore.

Changes may be made in the form, construction and arrangement of parts from those disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

I claim:

1. A device for shredding paper and like material comprising:

a. a pair of rolls adapted to be rotated in opposite directions,

b. a plurality of shredding discs on each of said rolls, each disc having two circumferential edges around its periphery and spaced apart axially along the length thereof, with the peripheries of the disc on one roll extending into the spaces between the discs on the other roll and spaced from the side faces thereof,

c. friction surfaces on the circumference of each disc to pull material therethrough while the rolls are rotating,

d. comb support means and a comb associated with each said roll having teeth thereon positioned between adjacent discs to prevent jamming of the material being shredded, and loosely mounted on said support means for floating movement axially and transversely of said rolls,

e. at least one of the circumferential edges of the discs on at least one of the rolls having a radius and being positioned adjacent the face of a disc on the other roll the circumferential edge of which is sharp.

2. A device for shredding paper and like material as defined in claim 1 wherein said radius on the circumferential edges of said discs is a maximum of .010 inches.

3. A device for shredding paper and like material as defined in claim 1 wherein said teeth on said comb are formed of a resilient material.

4. A device for shredding paper and like material as defined in claim 1, wherein said comb support means includes upper and lower support rods associated with each said roll, and each of said teeth being loosely mounted on said support rods, thereby to float between

adjacent discs during the shredding operation.

5. A device for shredding paper and like material comprising:

a. a pair of rolls adapted to be rotated in opposite directions,

b. a plurality of shredding discs on each of said rolls spaced apart axially along the length thereof, with the peripheries of the discs on one roll extending into the spaces between the discs on the other roll and spaced from the side faces thereof,

c. friction surfaces on the circumference of each disc to pull material therethrough while the rolls are rotating,

d. a comb associated with each said roll having teeth thereon positioned between adjacent discs to prevent jamming of the material being shredded, and

e. one circumferential edge of each disc on each said roll having a radius which is a maximum of .010 inches and being positioned adjacent the face of a disc on the other roll, the circumferential edge of which is sharp.

6. A device for shredding paper and like material comprising:

a. a pair of rolls adapted to be rotated in opposite directions,

b. a plurality of shredding discs on each of said rolls spaced apart axially along the length thereof, with the peripheries of the discs on one roll extending into the spaces between the discs on the other roll and spaced from the side faces thereof,

c. friction surfaces on the circumference of each disc to pull material therethrough while the rolls are rotating,

d. a comb associated with each said roll having teeth thereon positioned between adjacent discs to prevent jamming of the material being shredded, and

e. both circumferential edges of each disc on one of said rolls having a radius which is a maximum of .010 inches and both circumferential edges of each disc on the other of said rolls being shapr.

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