This invention relates to flexible sheet material trimming apparatus and more particularly relates to apparatus for trimming the edges of sheet material to be employed in bags and the like.

When sheet material has been formed into tubular condition for the formation of bags, and alternatively when bags have been filled with material, it is desirable that the edges of a bag of sheet material be trimmed so as to facilitate subsequent bag-closing procedures. This is particularly true with regard to sheet material which is of heat-sealable nature.

In the past, such devices as have been used for trimming of such bags have been inadequate in several respects, but one of the primary disadvantages of prior art devices has been that the trimming devices have failed to produce a smooth and uniform edge such as to facilitate the subsequent procedures in a high speed bag-closing operation. Furthermore, it has been found that the devices used in the actual cutting have necessarily been frequently replaced for sharpening.

It is to the elimination of these and other disadvantages to which the present invention is directed along with the inclusion of other novel and desirable features.

An object of the present invention is to provide a new and improved flexible sheet material trimming device of simple and inexpensive construction and operation.

Another object of the present invention is to provide a novel apparatus for trimming the edge of a flexible sheet material bag smoothly and uniformly with sufficient accuracy and sufficient speed as to facilitate use with other high speed bag-closing equipment.

Another object of the present invention is to provide an improved and novel bag top-trimming apparatus wherein the edges produced are smooth and uniform and wherein the material-cutting elements maintain themselves in an extremely sharp condition with only a minimum of attention thereto as to eliminate the need for frequent replacement of the cutting elements.

A still further object of the present invention is the provision of a bag top-trimming apparatus wherein the edges produced in the trimming operation are smooth and uniform so as to facilitate subsequent trimming of said edges in the bag-closing procedures, and wherein the scrap removed in the trimming operation is disposed of so as to prevent subsequent interference between said scrap and the sheet material bags being trimmed and thereby avoid subsequent complications in the bag-closing procedures.

These and other objects and advantages of the invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

FIG. 1 is a top plan view of the invention with portions thereof broken away for clarity of detail;

FIG. 2 is a front elevation view of the invention with portions thereof broken away for clarity of detail;

FIG. 3 is a bottom plan view of the invention with portions thereof broken away for clarity of detail;

FIG. 4 is an end elevation view of the invention with portions thereof broken away for clarity of detail;

FIG. 5 is a detail sectional view of the invention on a line as indicated substantially at 5-5 in FIG. 1; and

FIG. 6 is a detail perspective view illustrating one form of apparatus for supplying the bags into the trimming apparatus.

One form of the trimming apparatus is shown in the drawings and is described herein. The trimming apparatus is indicated in general by numeral 10 and includes a frame 11, which includes a pair of flat rigid plates 12 and 13 disposed in a common plane and in side-by-side relation with each other. The edges 12a and 13a are spaced from each other so as to define an elongate guideway 14 therebetween. The portion 14a of the guideway extends in the longitudinal direction of travel indicated by arrow A of the bags B passing through the trimming apparatus, and the portion 14b of the guideway extends transversely of the portion 14a so as to permit travel of the scrap strip S of sheet material that is removed during the trimming operation.

The frame 11 also includes rigid mounting blocks 15 and 16 which are affixed as by screws 17 to the plates 12 and 13 for maintaining said plates in said predetermined relation with each other. The frame 11 also includes an upright frame plate 18 which is affixed to the frame plates 12 and 13 as by screws 19. It will be noted that the rigid blocks 15 and 16 and the frame plate 18 extend across the guideway 14 and thereabove.

The apparatus 10 is provided with a pair of flat and hardened sharp-edged sheet material-bearing discs 20 and 21 disposed in overlapping and engaged relation with each other. The cutting discs 20 and 21 lie in a generally parallel but slightly angular relation with each other so as to engage each other only at the point of convergence 22 at the leading end of the area of overlap between the discs toward which the bag B is carried. It will be seen that the disc 21 underlies the disc 20 and it will be understood that whereas the disc 29 lies substantially horizontally, the disc 21 is slightly inclined so that the side 21a thereof is very slightly above the elevation of the side 21b thereof. The magnitude of the angular relation between the discs is extremely small and is substantially incapable of being illustrated. However, the angular relation is such as to produce engagement between the discs primarily at the point of convergence therebetween at the leading end of the area of overlap.

It will further be noted that the discs are staggered slightly in relation to each other along the direction A of bag travel and for purposes hereinafter more fully pointed out.

The cutter disc 20 is affixed as by washer 23 and screw 24 to the end of rotary mounting shaft 25 which extends upwardly into and is journaled in the rigid mounting block 15, and is secured therein by a locking screw 26. The shaft 25 also has a chain sprocket 27 affixed thereon for driving the shaft and cutter disc 20 by operation of the drive and sheet material conveying chain 28 as hereinafter more fully described.

The cutting disc 21 is similarly secured by washer 29 and screw 30 to a rotary drive shaft 31 which is journaled in a swingable mounting block 32 and is secured therein by the locking screw 33. The shaft 31 also has a chain sprocket 34 affixed thereon for driving the rotary disc 21 under influence of the drive and sheet material conveying chain 35 as hereinafter more fully described. The movable cutter mounting block 32 is swingable through a limited arc about the axis of pivot rod or hinge pin 36 which extends through a bearing aperture 37 in the block 32 and secured by a collar 38. The hinge pin 36 is integrally with, but disposed concentrically of the cylindrical mounting end portion 39 which extends through bearing aperture 40 in the mounting block 15. The mounting
end portion 39 is rotatable in the aperture 40 and is retained against endwise movement and against rotation by set screws 41 which extends into a groove 42 in the theoretical surface of the mounting portion 39 of the hinge pin. It will be noted that the hinge pin 36 is provided with a screw driver slot 42 so as to facilitate rotation of the hinge pin in the mounting block 15 when said screw 41 is loosened in order to effect raising and lowering of the mounting block 15.

Means are provided for continuously urging the tiltable lower disc 21 upwardly into engagement with the stationary rotary disc 20 and in the form shown, such means comprise a tension spring 43 secured at its upper end to the bracket structure 76 which is affixed to the underside of the frame plate 18. The lower end of spring 43 is connected to a pin 47 which is afixed to the top of movable mounting block 32.

Means are provided for conveying the bags B to the cutting discs 20 and 21 and retaining the upper edge portion of the bags in substantially planar condition during the trimming operation and in the form shown, such means includes the chains 28 and 35 which are continuous and which are guided along the guideway 14 and around continuous paths. It will be noted that in the runs 35a and 35b of the chains, the chains are disposed in face-to-face and engaged relation with each other. It will be understood that the bag B along its upper edge and carry the bag to the cutting discs 20 and 21 and then carry the spring of said material removed from the bag transversely away from the bag which will thereafter be entirely supported and conveyed by other means such as the bag-gripping conveyor chains 48 and 49 illustrated diagrammatically in FIG. 6 and FIG. 2 and which may comprise a portion of a cooperating bag-sealing mechanism. It should be understood that the bag B might well be independently supported at its bottom by a belt type conveyor or even by hand, but the nature of the conveyor illustrated by chains 48 and 49 is not critical to the present invention.

As the bag continues to travel in the direction of arrow A, the strip of scrap S removed from the bag by the cutting discs at 22 is retained by the chains 28 and 35 and is transported in the direction of arrow W to be disposed of at a location well away from bag B.

Chain 23 is trained around the sprocket 27, around a guide roller 50 and around a drive sprocket 51. The guide roller 50 is readily adjustable mounted on an eccentric bearing 52 which is carried by an adjustable slide block 53, the position of which is controlled by thumb screw 54 and in cooperation with spring 55 and the frame plate 18. Chain 28 is also guided by a stationary guide block 56 affixed to the frame plate 13 and by guide rollers 57 and 58, both adjustably mounted on the frame plate 13 by eccentric bearing 59 and a block slide 60 respectively.

The chains 35 and 32 are meshed with the disc driving sprocket 34 as the chains substantially tangentially travels therealong and is trained around guide rollers 61 and 62 and drive sprocket 63.

Guide rollers 61 and 62 as well as guide roller 64 are adjustably mounted and journaled by eccentric bearing 65 secured to the frame plate 12. The chain 35 is also guided by a stationary block 66 which maintains the chain 35 in confronting relation against the chain 28 as the chain 28 passes around the sprocket 27. Chain 35 is also guided by the stationary guide block 67 which is disposed opposite the guide block 56 for maintaining the chains 28 and 35 in sheet material-clamping relation with each other.

The drive sprockets 51 and 63 are respectively afixed to the drive shafts 68 and 69 which are journaled in the mounting block 16 and which have identically sized pinion gears 70 and 71 affixed thereon and meshed with each other. The shaft 68 also has a sprocket 72 affixed on the upper end thereof and in driven relation with a drive shaft 73 which is driven from a sprocket 74 on shaft 75 which is journaled at its upper and lower ends by a bracket structure 76 which is secured to the stationary mounting block 15 by a screw 77. The bracket 76 is vertically adjustable by means of the screw 77 which extends through the elongate slot 78 in the upright portion 76a of the bracket. Vertical adjustment of the bracket 76 is controlled by the adjustment screw 79, the lower end of which bears against the top of mounting block 15. Shaft 75 also has a sprocket 79 secured thereon and driven by a drive chain 80 which supplies rotary power thereto from a source of power such as motor 81.

It will be understood that the motor 81 may comprise or also may be, drivably connected with other apparatus with which the trimming apparatus 10 is related.

In operation the bag B is supplied into the portion 14a of the guide way and the upper edge portion immediately received and clamped and conveyed along by the cooperating chains 35 and 28. The sheet material of the bag B will subsequently engage the cutting discs 20 and 21 at the point of engagement 22 at which time the cutting discs engage each other and rotate against each other to produce a shearing action. The material in the bag B is sheared at this point of convergence 22, whereupon the lower portion of the bag B is released from the small severed strip S which is continued along the conveyor and conveyed transversely outwardly away from the bag B.

It will be further so as to that at the point of convergence 22 of the cutting discs, there will be some wearing of the discs. The slightly angular relation between the discs and limited engagement between the discs at the point of convergence produces substantially even wear on each of the discs and minimizes the dulling of the discs due to engagement of the sharp edges. As any wearing occurs, the spring 43 continues to maintain the discs in shearing relation with each other.

After a substantial period of usage and when it is detected that cutting could be improved, the eccentric hinge pin 36 is rotated slightly so as to lower the movable block 32 and increase the angular relation between the discs 20 and 21, whereupon frustro-conical or somewhat tapered surfaces formed around the discs are essentially disengaged from each other and the discs are again in engagement with each other only at the peripheral edge. The eccentric hinge pin is adjusted, the actual magnitude of movement of the mounting block 32 is relatively small and sufficiently small as to prevent any material change in the relationship of sprocket 34 to the chain 35.

It will be seen that we have provided an improved bag-top trimming apparatus wherein the cutting discs have a self-sharpening effect upon each other and wherein only an infrequent small adjustment is desired to maintain the cutting discs operating at maximum efficiency; and also wherein the bag itself is positively gripped and maintained in planar condition when fed into the cooperating material-shearing edge portions of the cutting discs so as to produce uniform and smooth severed edges, and whereupon the scrap removed is carried transversely away from the area of cutting.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of our invention which consists of the matter shown and described herein and set forth in the appended claims. What is claimed is:

1. Apparatus for trimming the edges of flexible sheet material as in bags and the like, comprising a frame, first and second juxtaposed rotary cutting discs oriented generally horizontally, said first disc overlapping said second disc in generally parallel but slightly angular relation therewith, said discs having sharp-edged material-shearing peripheral portions in lapped relation with each other along an elongate and narrow area, said elongate area of overlap having a leading
end defining a point of convergence at which the sharp-edged peripheral portions of the discs engage each other for shearing the sheet material supplied thereto,

mounting means journaling said first disc on the frame,
mounting means journaling said second disc and pivot-ally connecting the second disc to the frame for swinging movement about a horizontal pivot axis extending generally transversely of said elongate and narrow area of overlap, said pivot axis being spaced from said point of convergence in a direction generally parallel to said elongate area,
elongate sheet material gripping and conveying means on the frame and above said discs and holding the edge portion of the sheet material in substantially upright condition, said conveying means extending and moving generally parallel of and toward said elongate area of overlap and toward said point of convergence for moving the sheet material to the discs for cutting, said conveying means also extending rearwardly from said point of convergence along said elongate area of overlap and thence transversely of said elongate area and outwardly from said discs for carrying the upper edge of scrap sheet material away from the area of the overlap,

means resiliently urging said discs toward each other to maintain the discs in engagement with each other at the point of convergence,

means for vertically adjusting the location of said pivot axis to facilitate changing the angle between said discs when the discs have been worn and thereby improve the cutting action of the discs, and rotary means secured to said discs and connected with said conveying means and revolving said discs to move the sharp-edged peripheral portions thereof toward and through said point of convergence and in the general direction of travel of the conveyor means and at a speed substantially identical to that of the conveyor means.

2. Apparatus for trimming the edges of flexible sheet material as in bags and the like, comprising

a frame,

first and second juxtaposed rotary cutting discs oriented generally horizontally, said second disc underlying said first disc in generally parallel, but slightly angular relation therewith, said discs having sharp-edged material-shearing peripheral portions in lapped relation with each other along an elongate and narrow area having a leading end toward which the sheet material is supplied, said leading end defining a point of convergence at which the sharp-edged peripheral portions of the discs engage each other and shear the sheet material supplied thereto,

mounting means journaling said first disc on the frame,
mounting means journaling said second disc and pivot-ally connecting the second disc to the frame for movement about a pivot axis extending transversely of said elongate area and said pivot axis being spaced from said point of convergence in a direction longitudinally of said elongate area whereby to permit tilting of the second disc about the pivot axis,

sheet material gripping and conveying means on the frame and including first and second conveyor chains extending and moving along a conveyor run forwardly toward and above the point of convergence of said discs carrying the sheet material thereto, said conveying run extending along and above said area of overlap and thence transversely and outwardly away from said discs, said chains being disposed in parallel, contiguous, and sheet material gripping relation with each other along said conveying run for suspending the sheet material and conveying the material into the point of convergence for cutting and thence carrying the scrap removed transversely away from the remainder of the sheet material,

means resiliently urging said discs toward each other to maintain the discs in engagement with each other at the point of convergence,

means for vertically adjusting the location of said pivot axis to facilitate changing the angle between said discs when the discs have been worn and thereby improve the cutting action of the discs, and a pair of chain sprockets each secured to a respective disc and engaged by said conveyor chain to be rotated therewith and move the sharp-edged peripheral portions of the discs toward and through said point of convergence and in the general direction of travel of the conveyor chains along said run and at a speed substantially identical to that of the conveyor chains.

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