

March 3, 1942.

L. C. SHIPPY

2,275,112

MANUFACTURE OF BUILT-UP BELLOWS

Original Filed Jan. 21, 1935 3 Sheets-Sheet 1

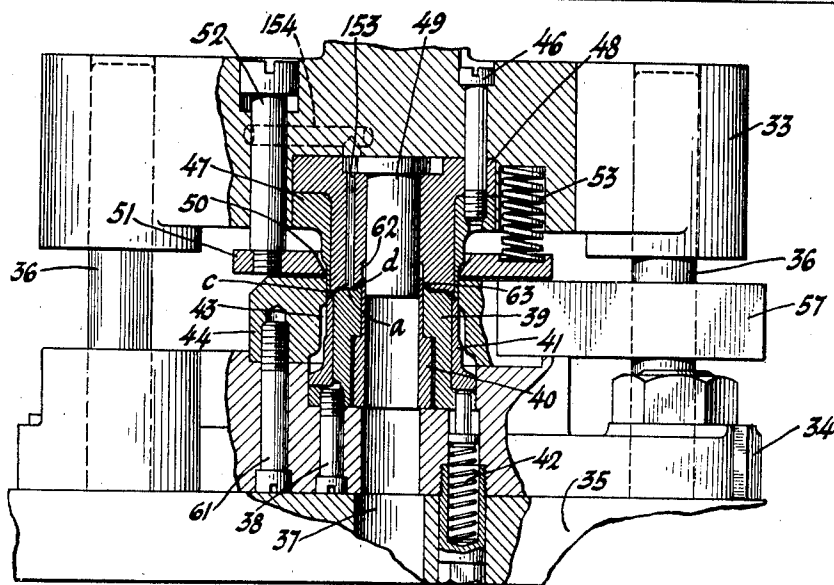
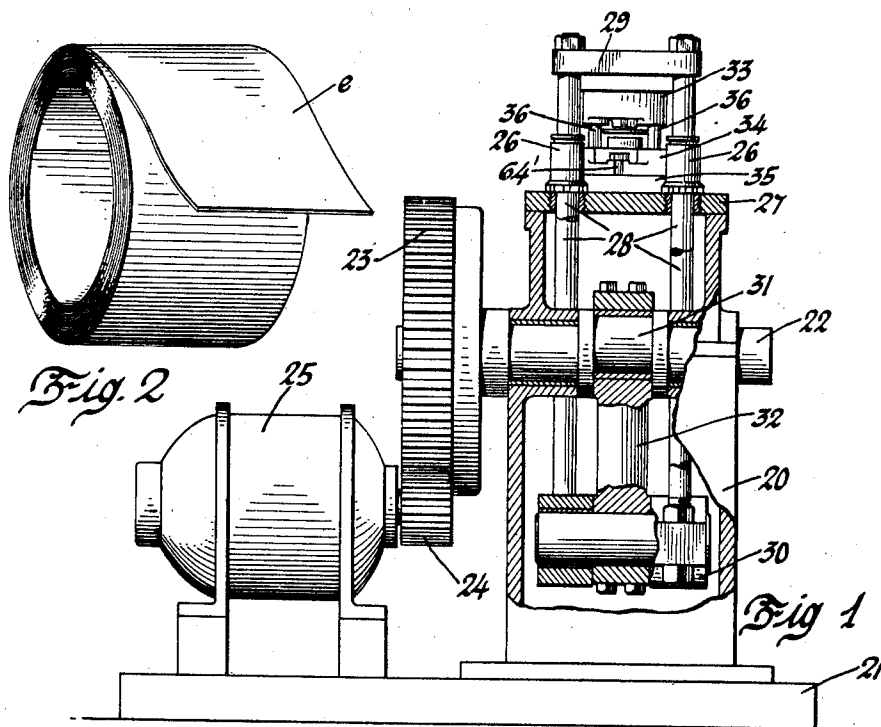


Fig. 3

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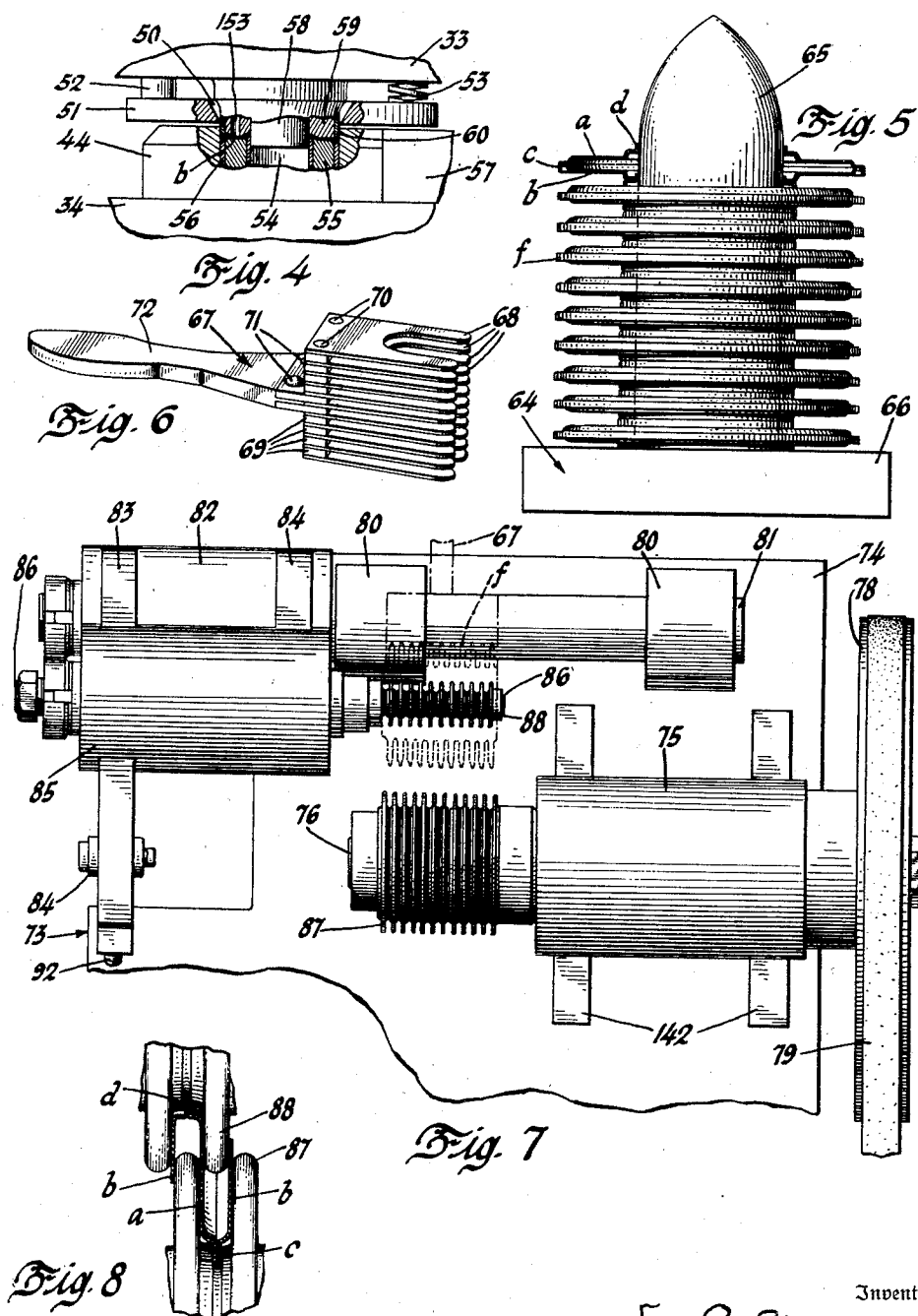
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MANUFACTURE OF BUILT-UP BELLOWS

Original Filed Jan. 21, 1935 3. Sheets-Sheet 2



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MANUFACTURE OF BUILT-UP BELLOWS

Original Filed Jan. 21, 1935 3 Sheets-Sheet 3

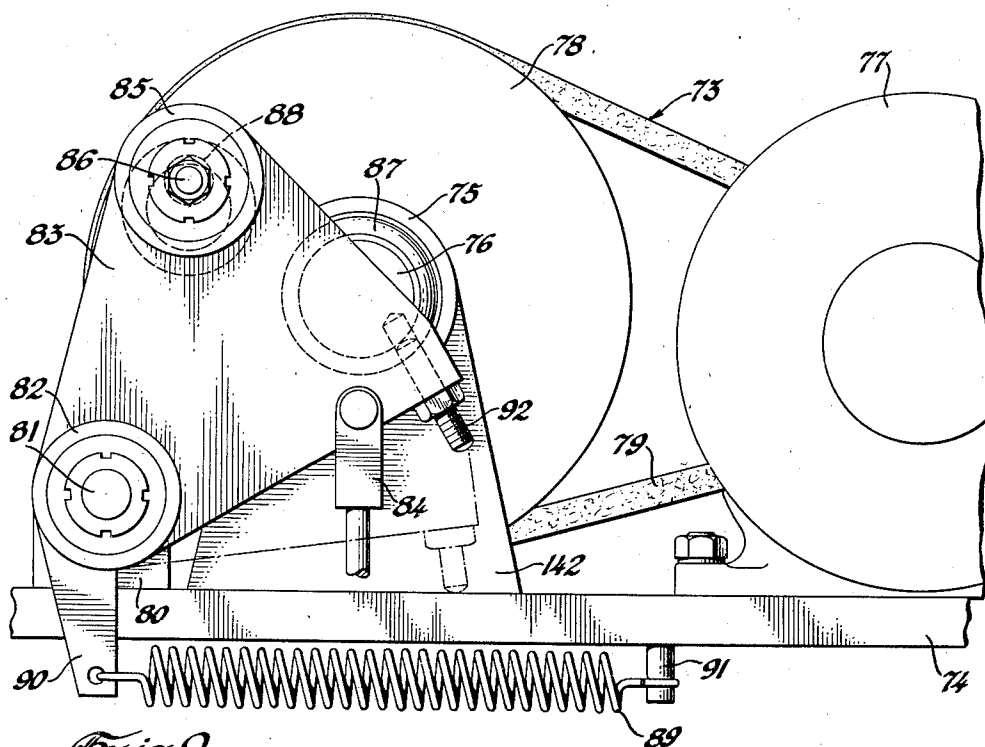


Fig. 9

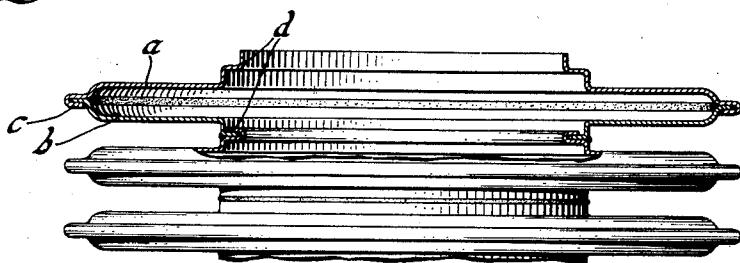


Fig. 10

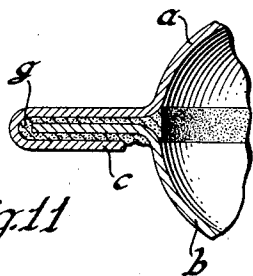


Fig. 11

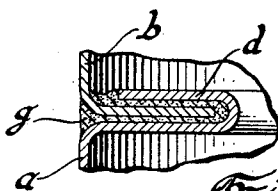


Fig. 12

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UNITED STATES PATENT OFFICE

2,275,112

MANUFACTURE OF BUILT-UP BELLOWS

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Original application January 21, 1935, Serial No. 2,687, now Patent No. 2,145,376, dated January 31, 1939. Divided and this application January 13, 1939, Serial No. 250,843

6 Claims. (Cl. 113—1)

This invention relates to the manufacture of built-up bellows of the type disclosed in the Schutt Patent No. 2,071,583 and resides in (a) apparatus by means of which the discs of which the bellows are to be made may be speedily and economically produced and (b) apparatus or a method by means of which discs may be speedily and economically assembled into a stack, transferred to a spinning machine and spun together.

This application is a division of my application which matured into Patent No. 2,145,376, dated January 31, 1939 in which there is disclosed in addition to what is disclosed in this application, apparatus or a method by means of which all of the joints of a spun together stack of discs may be soldered in a single operation to which the claims of the patent are restricted.

For a better understanding of the nature and objects of this invention reference is made to the following specification, wherein there is described the preferred embodiment of the invention which is illustrated in the accompanying drawings.

In the accompanying drawings:

Figure 1 shows, partly in elevation and partly in section, a dieing machine which may be used in producing the male and female discs of which the bellows to which this invention relates are made.

Figure 2 is a perspective view of a roll of stock from which the discs may be made.

Figure 3 is an enlarged view, partly in section and partly in elevation, of the dies used in the dieing machine to produce the female discs from the stock.

Figure 4 is an enlarged fragmentary view, partly in section and partly in elevation, of the dies used in the dieing machine to produce the male discs from the stock.

Figure 5 shows a stacking stand with male and female discs produced by the dieing machine stacked on it.

Figure 6 is a perspective view of a disc holder for transferring a stack of discs from the stacking stand to the spinning machine shown in Figures 7, 8 and 9 and holding them during the spinning operation.

Figure 7 is a fragmentary plan view of a machine for spinning a stack of discs together.

Figure 8 is an enlarged fragmentary view of a pair of discs in the spinning machine.

Figure 9 is a fragmentary side elevation of the spinning machine.

Figure 10 is a fragmentary view, partly in elevation and partly in section, of a completed bellows.

Figures 11 and 12 are, respectively, enlarged

sections through one of the outer joints and through one of the inner joints of the bellows shown in Figure 10.

The dieing machine shown in Figure 1 includes a hollow base 20, which is mounted on a floor plate 21. In opposite side walls of the base, there is journaled a shaft 22. To one end of the shaft 22, without the base, there is fixed a gear 23 which meshes with a gear 24 which is fixed to the shaft of an electric motor 25, which is also mounted on the floor plate 21. Through guides 26 which are secured in a plate 27 which closes the upper end of the base 20, there extend four rods 28. To the upper ends of these rods there is secured a head 29, and to the lower end thereof within the hollow base a head 30. On the shaft 22 between its ends, there is formed a crank 31, which is connected to the lower head 30 by a connecting rod 32.

Each of the sets of disc blanking and forming dies which are shown in Figures 3 and 4 includes an upper block 33 and a lower block 34 which is secured to a bolster plate 35. To the lower block of each set of dies, there are secured guide rods 36 which extend through openings in the upper block of that set.

In a recess in each of the lower blocks 34, there is seated a lower forming die. Each of these forming dies consists of three annular elements which are designated by the reference characters 40, 39 and 41 in Figure 3 and by the reference characters 54, 55 and 56 in Figure 4. The opening in the inner die element registers with an opening 37 in the block 34 in which it is seated and in the bolster plate 35 to which the block is secured. The inner and intermediate die elements of each set are secured to the block 34 in which they are seated by screws 38. The outer die element of each set is movable up and down with respect to the inner and intermediate die elements thereof and is urged to its uppermost position by springs 42. The upper end of each of the lower forming dies extends into an opening 43 in a lower blanking die 44 which is secured by screws 61 to the block 34 in which the forming die is seated. Each of the lower blanking dies 44 limits upward movement of the outer element of the lower forming die with which it is associated and has secured thereto a shelf 57.

In a recess in each of the upper blocks 33, there is seated an upper blanking and forming die. Each of these blanking and forming dies consists of a cylindrical element and two annular elements which are designated in Figure 3 by

the reference characters 49, 48 and 47 and in Figure 4 by the reference characters 58, 59 and 60. The die elements of each set are secured to the block 33 in which they are seated by screws 46. Each of the cylindrical elements 49 and 58 is coaxial with and of such diameter that it can just slide into the opening in the inner element of the lower forming die with which it is associated. Through each of the intermediate elements 48 and 59, there extend vertical bores 153 whose upper ends communicate with a bore 154 in the block 33 in which the element is seated. Each of the outer annular elements 47 and 60 is coaxial with and of such external diameter that it can just slide into the opening 43 in the lower blanking die with which it is associated. The lower end of each of the upper blanking and forming dies extends into an opening 50 in a plate 51 which is connected by guide pins 52 to the block 33 in which the die is seated so that it can move toward and away from it. Springs 53 urge the plate 51 toward its lowermost position.

To insure the formation of perfect solder joints during the soldering operation hereinafter referred to, it is preferable that the dies shown in Figure 4 be designed to provide for the formation of scallops, such as those illustrated and described in the Schutt patent previously mentioned, in the outer edges of the male discs *b*. Otherwise, the dies shown in Figure 3 differ from those shown in Figure 4 principally in that the former are shaped to provide for the formation of flanges *c* and *d* on the outer and inner edges of the female discs *a* by (1) making the intermediate die element 48 of greater external diameter than the intermediate die element 39 by the thickness of the stock from which the discs are made, (2) making the outer die element 47 of such length that it extends beyond the lower end of the intermediate die element 48 a distance equal to the depth of the flanges *c* and the outer die element 41 of such length that when it is in its lowermost position it terminates below the outer portion of the intermediate die element 39 the same distance and (3) providing in the inner edge of the intermediate die element 48 a rabbet 62 of considerably greater depth than the flanges *d* and a counter-rabbet 63 whose depth is equal to that of the flanges *d* and whose width is equal to the thickness of the stock from which the discs are made and making the inner die element 40 of such length that it extends into the rabbet 62 beyond the counter-rabbet 63 when the dies are closed.

Each of the sets of blanking and forming dies is designed for installation in a dieing machine, such as that shown in Figure 1, with the upper block 33 secured to the upper head 29 by screws (not shown) and the lower block 34 and bolster plate 35 secured to the plate 27 by screws 64'.

The stacking stand which is designated by the reference character 64 consists of an upstanding stud 65 mounted on a base 66. The external diameter of the stud, which has a blunt point on its upper end, is slightly less than the internal diameter of the female discs *a*.

The disc holder 67 is a fork-like implement which consists of a number of deeply notched plates 68 spaced apart by strips 69 and secured together by rivets 70. To two of the strips 69 which are wider than the others, there is secured by rivets 71 a handle 72.

The spinning machine 73 consists of a table 74 on which near one side there are mounted

brackets 142 which support a bearing 75 in which there is journaled a shaft 76. On the same side of the table as the bearing 75, there is mounted an electric motor 77 on whose shaft there is secured a pulley (not shown). Around this pulley and a pulley 78 on the shaft 76 extends a belt 79.

In brackets 80 which are mounted on the table 74 on the side of the shaft 76 opposite that on which the electric motor 77 is mounted, there is secured an axle 81 which extends parallel to the shaft 76. On the end of the axle 81 near the side of the table 74 opposite that on which the bearing 75 and the electric motor 77 are mounted, there is journaled a bearing 82. To the bearing 82, there are welded plates 83 and 84 which carry a bearing 85. In the bearing 85, there is journaled an arbor 86 which extends parallel to the shaft 76. On the inner end of the arbor 86, which extends considerably beyond the inner end of the shaft 76, there is formed an annularly corrugated crimping roll 88. On the inner end of the shaft 76 opposite the roll 88, there is secured a considerably larger annularly corrugated crimping roll 87 which is so disposed axially of the shaft 76 that each of the annulets on the roll 88 is located opposite one of the annular grooves in the roll 87.

The spring 89 which is connected to an arm 90 on the bearing 82 and to a stud 91 on the table 74 tends to swing the arbor 86 and the roll 88 about the axle 81 away from the shaft 76 and the roll 87. For moving the roll 88 about the axle 81 toward the roll 87, there is provided a pedal (not shown) which is connected to the plate 83 by a link 84. A set screw 92 which is adapted to engage the table 74 limits movement of the roll 88 toward the roll 87.

In manufacturing built-up bellows of the type disclosed in the Schutt patent previously mentioned in accordance with the present invention, rolls *e* of thin metal strip, such as that shown in Figure 2, is preferably employed as stock.

The first operation in the manufacture of the bellows is that of blanking and forming the discs. To blank and form the female discs, I utilize a dieing machine, such as that shown in Figure 1, equipped with dies such as those shown in Figure 3 and to blank and form the male discs I utilize a similar machine equipped with dies such as those shown in Figure 4.

When a dieing machine such as that shown in Figure 1 is operating, its upper die is moved alternately toward and away from its lower die by the electric motor 25 and stock from a roll *e* is advanced over the table 57 and between the dies with an intermittent motion by suitable mechanism (not shown). The motion of the stock is so synchronized with that of the upper die that it is stopped just before or at the moment the plate 51 engages the stock on each downward stroke of the upper die and is advanced during the time that the upper die is clear of the stock such a distance that a fresh length of stock is presented to the dies upon each downward stroke of the upper die.

While the plate 51 is in engagement with the stock, it prevents shifting of it by clamping it between itself and the shelf 57 and lower blanking die 44. After the plate 51 engages the stock, further downward movement of the upper die brings the outer and inner elements thereof into engagement with the stock and effects the blanking of a disc. After the disc is blanked, further downward movement of the upper die imparts to

it the desired concavo-convex form and in the case of the female disc forms on it the flanges *c* and *d*.

As the upper die moves upwardly after completing each blanking and forming operation, the springs 42 move the outer element of the lower forming die upwardly and free the disc from the die. Blasts of air which issue from the bores 153 and another blast of air which issues from a suitably located nozzle (not shown) as the upper die clears the lower die on each of its upward strokes free the disc from the upper die and sweep it clear of the dies and into a suitable receptacle (not shown). It will, of course, be understood that the small disc which is punched from the stock by the cylindrical element of the upper die during the forming operation is forced into the opening in the inner element of the lower die and, thence, into a suitably located receptacle (not shown) through the opening 37.

After blanking and forming the discs, the next step in the manufacture of the bellows consists in impaling a number of discs, alternately a female disc *a* and a male disc *b*, on the stacking stand 64 in the manner illustrated in Figure 5. The stack *f* of discs on the stacking stand is then "speared" by the disc holder 67 in such a manner that each juxtaposed pair of discs *a* and *b* becomes sandwiched between a pair of the plates 68 with each of the flanges *d* in engagement with the end of one of the notches in the plates. Then, by manipulation of the disc holder 67, the stack *f* of discs is removed from the stacking stand 64 and impaled on the roll 88 of the spinning machine 73. After the stack *f* of discs is properly disposed on the roll 88 the operator moves the arbor 86 and roll 88 toward the rotating shaft 76 and roll 87, with the result that each juxtaposed pair of outer edges of the discs enters one of the grooves in the roll 87 and each juxtaposed pair of inner edges of the discs enters one of the grooves in the roll 88. After the edges of the discs have entered the grooves in the rolls 87 and 88, further movement of the rolls toward each other locks together the discs which constitute the stack *f* by folding the flanges *c* and *d* of the female discs *a* over the juxtaposed edges of the male discs *b*, as shown in Figure 8. After the described operation has reached the stage at which the flanges *c* and *d* have been folded over the juxtaposed edges of the male discs sufficiently to prevent separation of the discs which constitute the stack *f*, the disc holder may be withdrawn from the stack, but to prevent mutilation of the discs during the spinning operation and faulty joints between the discs it should not

be withdrawn before the operation has reached this stage.

After the discs which constitute the stack *f* have been locked together, the manufacture of the bellows is completed by soldering the joints in the stack so as to produce between their elements solder bonds like those designated by the reference character *g* in Figures 11 and 12. To carry out this operation, I prefer to employ a soldering machine like that disclosed in my patent hereinbefore referred to.

I claim:

1. In the manufacture of built-up bellows, the operations of forming discs, stacking discs on a stand, spearing the stack of discs with a disc holder, transferring the stack of discs from the stand to a spinning machine by manipulation of the disc holder, holding the stack of discs in assembled relation in the spinning machine by means of the disc holder until the spinning operation is at least partially completed, transferring the spun together stack of discs to a soldering machine, and soldering the spun joints in the soldering machine.

2. In the manufacture of built-up bellows, the operations of spearing a stack of discs with a disc holder, transferring the stack of discs to a spinning machine by manipulation of the disc holder, and spinning together the stack of discs.

3. In the manufacture of built-up bellows, the operations of spearing a stack of discs with a disc holder, transferring the stack of discs to a spinning machine by manipulation of the disc holder, and utilizing the disc holder to hold the discs during the spinning operation.

4. In the manufacture of built-up bellows, the operations of transferring a stack of discs to a spinning machine by manipulation of a disc holder, holding the stack of discs in assembled relation in the spinning machine by means of the disc holder until the spinning operation is at least partially completed, and completing the spinning operation.

5. In the manufacture of built-up bellows, the operations of holding a stack of discs in assembled relation in a spinning machine by means of a disc holder until the spinning operation is at least partially completed, and completing the spinning operation.

6. In the manufacture of built-up bellows, the operations of stacking discs on an upstanding stud, spearing the stack of discs with a disc holder, transferring the stack of discs to a spinning machine by manipulation of the disc holder, and spinning together the stack of discs.

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