

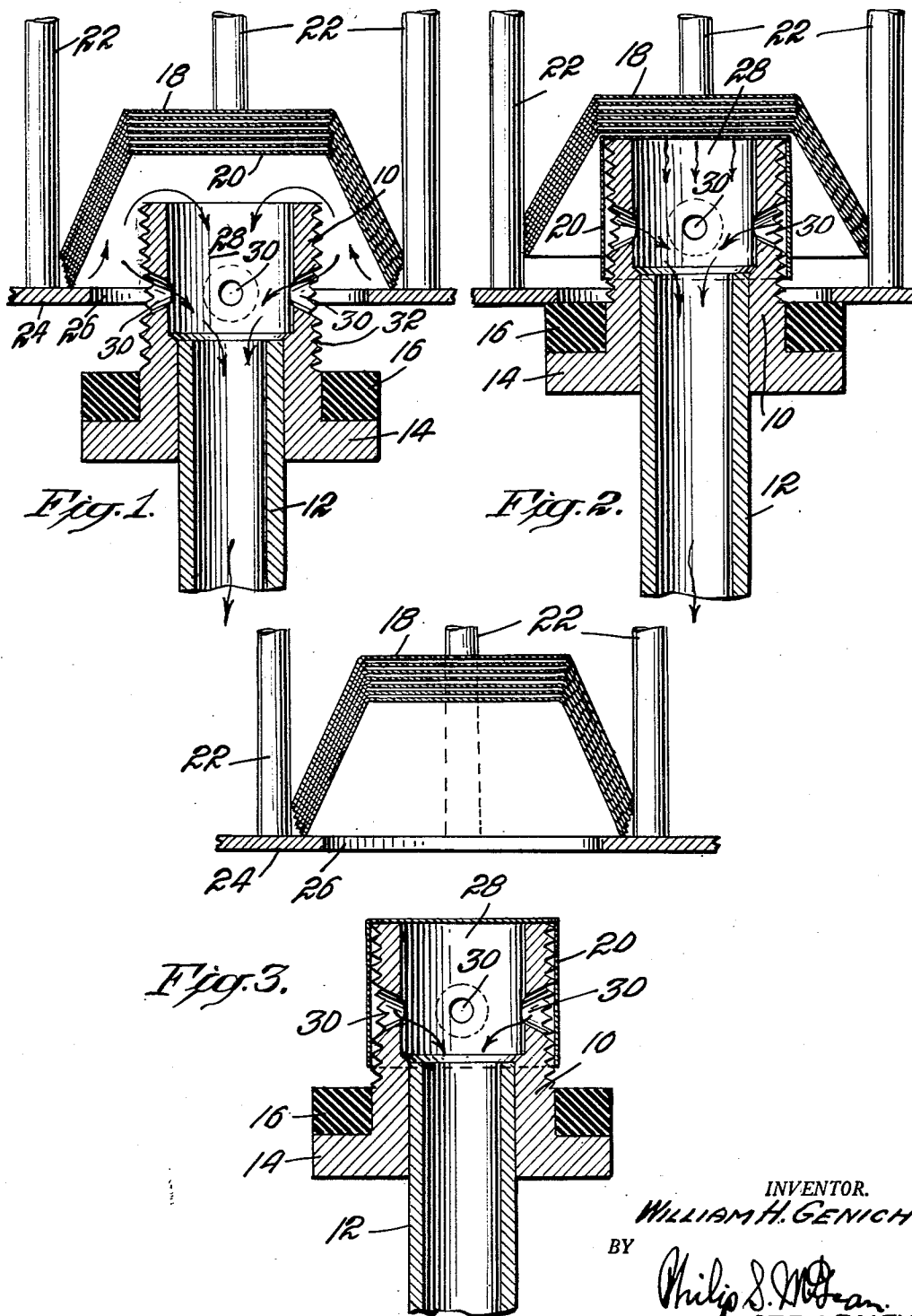
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PAPER CUP HANDLING

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PAPER CUP HANDLING

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This invention relates to machines for separating a paper cup or the like from a vertical stack of inverted internested cups and, in particular, the aim of the invention is to provide improvements in the methods of and means for thus handling a cup.

A paper cup of the kind with which the present invention has been successfully worked is the familiar frusto-conical cup shaped from a circular paper blank to have a fluted or crinkled side wall, and used as an open-top container for confections of various kinds. Such cups are commonly referred to as crinkle cups; and machines are in use for handling crinkle cups in preparation for adding to them fillers of the selected confection. A typical machine of this type is one having one or more upright crinkle cup containers, a so-called suction head below each container, a horizontal support at a level below the container bottoms, and means for swinging said head about a horizontal axis through 180° after the head has been operated to detach one cup from the container thereabove, thereby to deposit said cup in upright condition on said support. Other details of said machines with which the present invention also is not concerned, are the use of conveyor belts or chains for providing said horizontal support, means for intermittently moving the said conveyor to or toward a filling station for the cups, and means for timing the movements of said conveyor and the movements of the suction heads.

The present invention concerns itself especially with the provision of a novel and improved method of and means for the handling of a crinkled paper cup in so far as is concerned the picking off, from a stack of the cups, of the lowermost cup in the stack, whereby without mechanical and other complexities as heretofore proposed and with the use merely of negative air pressure the cup may be thus separated from the stack in a manner such that absolute dependence may be had that, at each prevised operation of a novel form of suction head which shall herein be called a picker, the lowermost cup of a stack of inverted internested crinkle cups, and only that lowermost cup, will be separated from all the cups thereabove in said stack, and then said picker with its picked-off cup will become so disposed that rotation thereof through 180° may safely follow without interference from the stack or its holder and at the same time without chance of loss of the picked-off cup from the picker until completion of said rotation.

The present invention is based on the discovery that if the area below the open bottom of the lowermost cup in the stack be temporarily fully or substantially fully closed, and a negative air pressure be set up inside said cup and at the same time there be set up a turbulence in the air in the cup, the side wall of said cup is vibrated or agitated in such manner that it becomes ruffled as it were, thereby to become urged to temporary collapse from the conical toward the cylindrical. The practical importance of this discovery and of the method of the invention, and said method, will all become clear here-

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inafter in connection with the detailed description of a now preferred means for carrying out the method of the invention as illustrated in the accompanying drawing.

Fig. 1 in the drawing is an axial sectional view through the picker, the stack or nest of paper cups, and the holder or magazine wherein the cups are stacked in inverted and internested condition as shown;

Fig. 2 shows the same parts as in Fig. 1, but with now the picker elevated more than in Fig. 1, and the lowermost cup collapsed at its side wall on the picker;

Fig. 3 also shows the same parts as in Fig. 1, but with now the picker retracted.

Referring to the drawing more in detail, the picker 10 is shown as fixedly mounted on a tubular stem 12 and as having a circumferential flange 14 carrying on its top an annular gasket 16 as one of rubber.

The stack of inverted internested cups is designated 18, the lowermost cup in the stack being marked 20.

The magazine for holding the nested cups is shown as having a skeletal side wall consisting of four vertical parallel round rods spaced apart 90°, three of these rods being shown and marked 22. The bottom of the cup magazine is provided by a retainer plate 24 having a central circular opening 26. All the just described parts of the magazine are suitably rigidly interconnected, and the magazine is suitably secured in fixed position.

The opening 26 at the lower end of the magazine is of less diameter than the mouth diameter of a cup, so that the stack of cups held centered on the retainer plate 24 by engagement of the rim of the lowermost cup with the rods 22, normally is supported on the retainer plate 24 without chance of any cup dropping through the opening 26.

The picker 10 is cup shaped at its upper end to provide an open top cylindrical well 28, said well being in direct communication at its bottom with the interior of the tubular stem 12.

Equidistantly spaced around the well 28 are inwardly tapering apertures through the side wall of the picker well. There are four of these apertures, all alike, three thereof being shown at 30.

The picker 10 is shown as having an external screw thread 32 extending helically down from the open top of the picker to a point marking the top level of the rubber ring or gasket 16.

Any suitable mechanism such as those well known in the art of so-called cup dropping machines may be used, operating at predetermined intervals and at proper timing with movements of the aforesaid belt or chain driven support or the like, for causing the picker to rise from such a position as that shown in Fig. 3 to and through such a position as that shown in Fig. 1, and then to such a position as that shown in Fig. 2, next for returning the picker to said Fig. 3 position, next for rotating the picker through 180° about a horizontal axis within a mount (not shown) for the lower end of the tubular stem 12 and for then relieving the suction below referred to, thereby to permit the cup 20, now right side up, to drop on a tray or the like on said support, and next to rotate the picker once more through 180° about said axis for a repeat cycle of operation relative to the cup stack 18.

While the picker is rising to approach its Fig. 1 position and during its further rise to its Fig. 2 position, and until it has been thereafter lowered to a prevised extent toward its Fig. 3 position, suction from a suitable source (not shown) is applied relative to the tubular stem 12, so as to set up a negative air pressure inside and immediately outside the picker and to cause air movements to ensue as indicated by the arrows in Figs. 1 and 2.

The picker rises high enough to cause the gasket 16 to seal the opening 26 in the retainer plate 24 of the cup

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magazine, this occurring just after the top of the picker first impinges against the bottom wall of the lowermost cup 20, with the result that the cup stack 18 is raised slightly and hence an annular air inlet is afforded around the rim of the lowermost cup 20; but with now, as just stated, the opening 26 in the retainer plate closed. Simultaneously air turbulences are apparently established in the annular chamber surrounding the picker and outwardly bounded by the side wall of the lowermost cup 20, due, it is believed, to the presence of the thread 32 on the picker.

Whatever be the precise explanation, what happens is that not only is the bottom wall of the lowermost cup 20 sucked tight against the annular top of the picker but, and this is vitally important, the flutings which crinkle the side wall of the cup are apparently so agitated or riffled as to temporarily elastically yield to compression one alongside the other, thereby temporarily to reduce said wall to a cylindrical shape as shown in Figs. 2 and 3, in response to suction from inside the picker applied by way of the four apertures 30. The thread 32 on the picker or some equivalent break-up of the external superficies of the picker, to create the air turbulences mentioned, is apparently essential, as a picker and all associated parts as herein shown and described except for such thread have been found not to operate as herein described, whereas with said thread present repeated tests have absolutely demonstrated that at every operation of the picker the lowermost cup of the stack, and only that cup, is seized by the picker, collapsed around the picker as described, and so remains until the suction in the tubular stem 12 is relieved; which relief will of course be arranged to occur, as has already been stated, when the picker, after having been lowered to or below its position shown in Fig. 3, has been rotated through 180° to give the cup an upright position for drop of the cup from the picker onto the support aforesaid.

The sequence of operation is a very simple one. The picker 10 rises, next engages the lowermost cup 20, and then in rising further, the cup 20 and the cups thereabove are lifted incidental to closure of the opening 26 by the gasket 16. While this last is occurring, the crinkled side wall of the cup 20 is riffled and drawn in by suction of the picker to collapse to cylindrical shape and clasp around the picker. Now the picker descends, easily passing the cup 20 through the opening 26 and when the remaining cups of the stack 18 follow the picker downwardly far enough to have the lowermost of said remaining cups reach the top of the retainer plate 24, said cups are halted by said plate.

By the present invention the complexities involved in the heretofore proposed so-called suction heads are all obviated, these arrangements all calling for the use of a suction head of a plurality of differentially operating instrumentalities, such as blast tube devices, flexible gripping fingers, rubber fingers, metallic stop fingers, cup-interior engaging fingers, cup-exterior engaging fingers, cup separating fingers, slidable fingers, etc.

Instead, the present invention provides for coaction with a source of suction, a very simple cup separating mechanism which comprises a cup holder or magazine having no moving parts, in combination with a picker having no moving parts but which as substantially a one-piece member merely rises and then descends relative to the magazine, thereby unerringly to remove the lowermost cup and only that cup from the bottom of a stack of the cups.

As already pointed out, it is a proven fact by actual and repeated test, that an essential in having the picker operate as described, is the presence of the thread 32 or some equivalent breaking up of the smoothness of

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the external superficies of the picker. So far tests have been conducted only in regard to a picker with a helical external thread, but it may well be that parallel circumferential groovings or various other groovings or shapings of the picker exterior for breaking up the otherwise smooth cylindricity thereof may give the same good results as obtained with the thread 32.

The cup-holding magazine shown, as has been pointed out, incorporates a side wall structure comprised of vertical round rods 22 spaced equidistantly around the circular opening 26 at the bottom of the magazine. Said rods are arranged in a circle concentric with said opening. Thereby the cup stack 18 is always properly centered, and at the same time friction is minimized to assist the stack to tend to descend merely by gravity so as to deposit the rim bottom of the lowermost cup on the plate 24 constituting the magazine bottom.

What is claimed is:

1. In a machine for separating a cup from a plurality of its fellows, the combination of a magazine for a stack of inverted internested crinkle cups having outwardly flaring side walls, said magazine having a bottom opening of a diameter less than the mouth diameter of said cups, a hollow picker of less diameter than said opening raisable therethrough for engaging at its top the bottom wall of the lowermost cup of said stack and lifting the stack, means for sealing said opening around the thus raised picker following raising of the stack by the picker to lift the mouth of the lowermost cup above the bottom of the magazine, there being a top opening and side openings in the picker and there being a hollow tubular picker carrier whereby a suction pull set up through said carrier will suck in air through said picker openings, and means comprising a screw thread on the exterior of the picker in communication with said side openings and disposed about substantially the entire exterior of the picker for acting in the presence of said suction to cause collapse onto the picker of the side wall of the lowermost cup thereby to reduce the mouth diameter of said cup to less than the diameter of said circular opening.

2. Machine for separating cups comprising a magazine for supporting a stack of the cups in inverted nested relation and having a bottom wall for normally supporting the stack, provided with a cup removal opening of less diameter than the normal mouth diameter of the cups, a hollow suction picker of less diameter than said opening and insertible up through said opening into suction engagement with the bottom wall of the lowermost cup supported on the bottom of the magazine and an annular closure and sealing member on said picker below the upper end of the picker, of larger diameter than said cup removal opening and engageable with the bottom wall of the magazine, closing said opening when the picker is engaged with the bottom cup, said picker having a suction inlet in the top of the same cooperative with the bottom wall of the lowermost inverted cup and suction inlets in the side of the same cooperative with the side wall of the lowermost inverted cup and said picker being externally grooved in communication with said side suction openings whereby to enable suction applied through the picker to collapse the side wall of the lowermost cup to a diameter less than the diameter of the opening.

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