July 13, 1965 L. P. BUCK ETAL 3,194,095

PUNCH CONFETTI REMOVER

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Fig. 1.

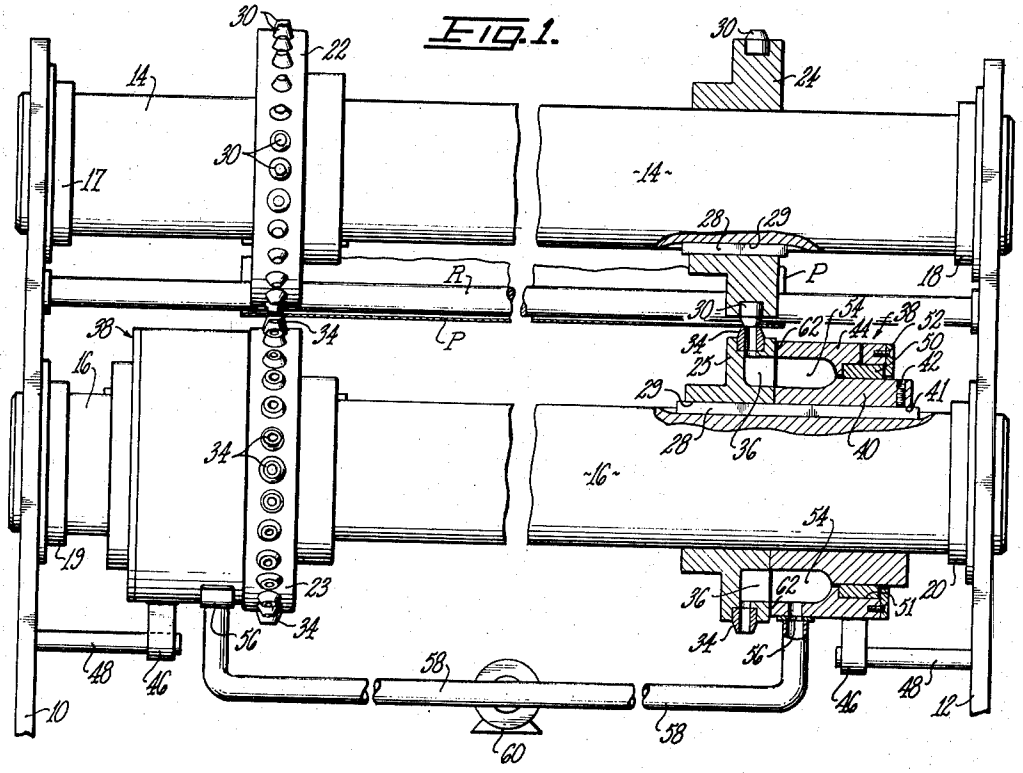


Fig. 2.

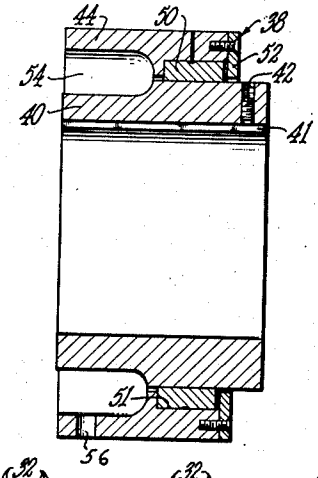


Fig. 3.

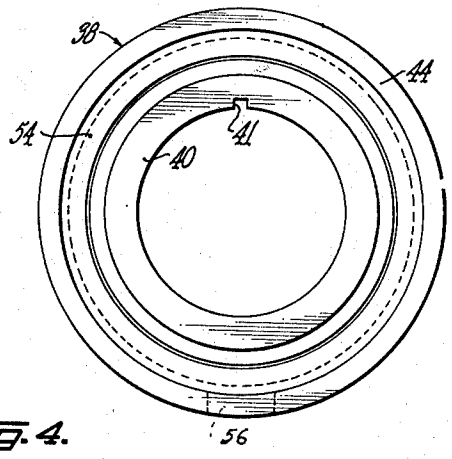
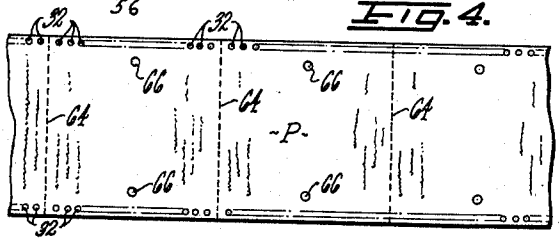


Fig. 4.



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Fig. 5.

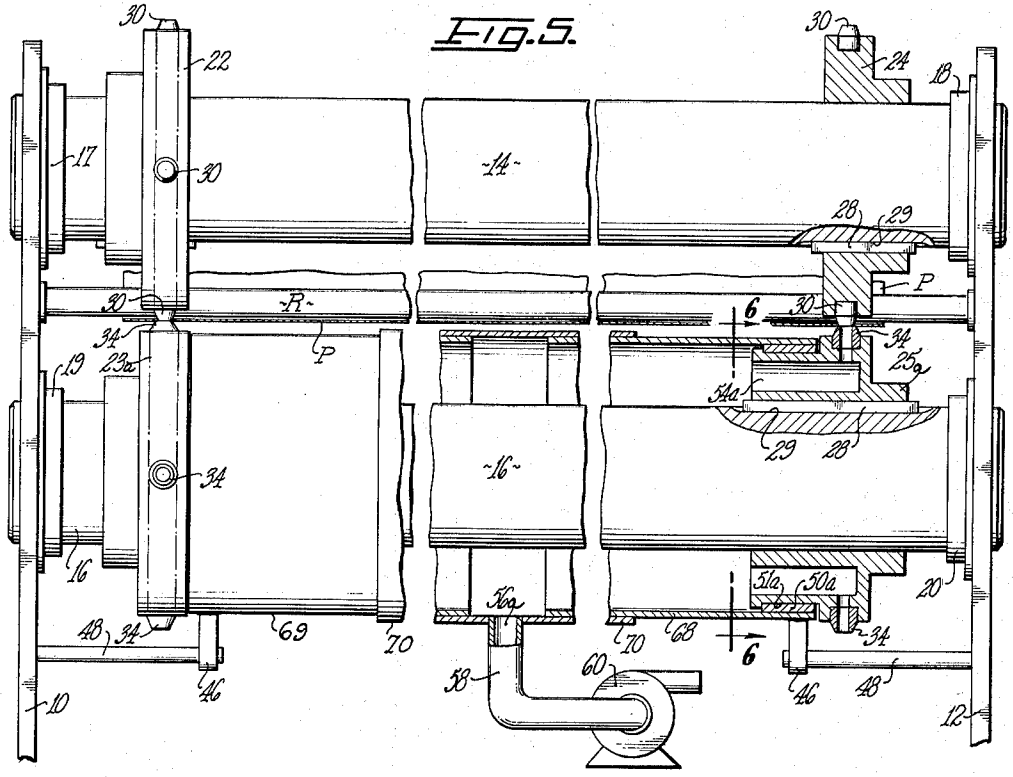
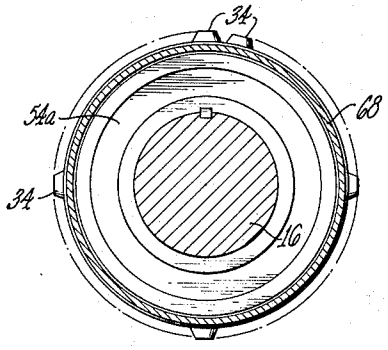


Fig. 6.



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PUNCH CONFETTI REMOVER

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1 Claim. (Cl. 83—100)

This invention relates to a unit which may be added to the rotary shaft carrying the female member of a pair of punch dies such as are presently associated with rotary web-fed printing presses. In the production of multiple business forms having punched-out indexing means (i.e. collating holes), said holes are formed in the continuously traveling sheet of paper usually subsequent to its printing, or at any rate as a closely associated step, so that the same mechanism draws the paper through the press and between the rotating punch dies. There may be one or more pairs, as well as successive series of the latter, in accordance with the desired spacing of the punch holes in a particular work piece. However, since the paper is traveling very fast (e.g. 300 inches per minute), and a relatively closely spaced series of line holes may be formed along each side margin of the moving strip (for example, every half inch) the quantity of punch-out or paper confetti is very considerable.

Currently the volume of such confetti is allowed to drop into an open-top hopper or receptacle. However a small amount may be influenced by the velocity of the machinery and the rushing strip of paper, and/or some of the paper disks become subject to electrostatic charges, so that a small number become attached to the moving sheet and cause trouble out of all proportion to their small number. Also, some of the confetti disks are incompletely severed from the perimeter of the hole until later, so that their subsequent retention in the printed forms, whether loose or still edge-attached, is practically assured. When such a particle lodges on a form beneath a subsequently-inserted sheet of carbon paper, it obviously blocks transfer of an impression (such as typing) from the carbon paper to the immediately underlying sheet. In addition, after such line-punching, when the multiple (printed) forms are put through a collating machine, retained confetti may there accumulate on the glue apertures so as to misalign the glue or even to block its flow.

Accordingly it is an object of the present invention to provide simple, highly effective and positive means for completely removing punch confetti from the vicinity of the punch dies substantially as soon as formed.

Another feature is the provision of such a device which may readily be added to existing rotary punch dies, and which may be axially adjusted along their carrying shaft to accommodate changed spacing therealong of the dies as they are shifted from one job to another, or to form successive series of punch holes. Likewise, the device can easily be transferred from one punch die to another. The invention provides suction means for continuously withdrawing confetti from the entire periphery of the rotary punch die without such means necessarily rotating with the shaft. Such suction also encourages the movement of the newly-formed confetti into the interior of the die, as well as aiding its complete severance from the work-sheet. This is all accomplished without requiring any structural changes in existing dies or the solid shafts which carry them; for example, such shaft need not be weakened by being made tubular or being surface-channeled. Alternately, new axially-inward opening female punch dies are provided having bearing surfaces adapted jointly to accommodate a single collector unit disposed between them so to provide a tubular confetti chamber about the shaft which can be telescopically

extended and retracted to conform to changes of die location.

Other objects and advantages will become apparent as the description proceeds, having particular reference to the presently preferred embodiments illustrated in the accompanying drawings wherein:

FIGURE 1 is a front elevational view of two pair of rotary punch dies with a pair of our collector units mounted adjacent the outer faces of the female punch dies on the lower shaft, the right pair of dies and confetti collector unit appearing in axial section with portions of the shafts broken away, and a strip of paper moving toward the reader between the rotating dies from beneath a roller;

FIGURE 2 is an axial sectional view through a collector unit, and FIGURE 3 is an end elevational view from the left of FIG. 2;

FIGURE 4 is a plan view of a strip of paper which has passed through several successive pairs of punch dies plus a cross-perforating roller, showing the punch holes and cross slits produced thereby;

FIGURE 5 is a view similar to FIGURE 1 but showing a pair of female dies (on the lower shaft) having the annular confetti outlet channel formed on the inner face of each die, and a modified collector unit telescopically extending between them about the shaft; and

FIGURE 6 is a transverse sectional view through the lower shaft and collector unit, taken along the line 6—6 of FIGURE 5.

Typically, a continuous strip or web of (paper) sheet material P is drawn forward (as from a rotary printing press) beneath a tension roller R, between a parallel pair of vertically separated, rotary shafts 14, 16 by conventional traction means (not shown). Upright frames or supports 10, 12 journal the oppositely rotating shafts 14, 16 by means of terminal bearing collars 17, 18, 19, 20.

A vertical pair of punch dies 22, 23, 24, 25 is concentrically secured adjacent each end of the two shafts 14, 16, being axially adjustable therealong (to accommodate paper of different widths) by means of a longitudinally inserted key 28 which is lodged in a correspondingly shaped keyway 29 formed jointly in the shaft and die. The male dies 22, 24 (on the upper shaft 14) carry an outer circle of radially projecting (cylindrical) studs or punch elements 30 spaced apart at their extremities to correspond to the desired spacing of punch holes 32 (FIG. 4). The corresponding female dies 23, 25 on the opposite shaft 16 have a similarly spaced ring of radially projecting nipples 34; the dies are keyed to their shaft for axial adjustment therealong so as to vertically align with the male die, each stud 30 thus being insertable a short distance into the corresponding nipple 34 so that upon joint rotation of the two shafts and a width of sheet material P being moved lengthwise therebetween, each vertical pair of dies cooperatively punches out a generally annular disk (or otherwise shaped in conformance with the terminal configuration of the dies). Each paper disk or piece of confetti thus punched out, passes downward through the nipple into an annular, laterally opening chamber 36 of the die. In the past, such confetti has been allowed to drop by gravity into a receptacle beneath (not shown).

By the present invention, there is now provided a generally cylindrical, collector unit 38 disposed about the shaft 16 adjacent each female die 23, 25 and in end-abutment therewith. The collector is formed with an inner concentric portion or ring 40 secured to the shaft by sliding a keyway 41 thereof along the key 28 and fastening it at the desired position as by a screw 42. Radially outward from the inner ring 40 is an overlying outer ring or body 44 which is fixed to the adjacent standard 10

or 12 by a bracket arm 46 adjustable axially along a transverse rod 48. Any suitable bearing sleeve or unit 50 may be disposed between the fixed 44 and rotary 40 rings, retained within the annular groove 51 by the facing annulus 52.

Axially inward along the shaft 16, the lengths of the concentric rings 40, 44 are radially spaced apart to define an annular chamber 54 which is in open communication with the die chamber 36 so that they jointly form a closed receptacle to receive confetti. An outlet or tubular coupling 56 is provided for the composite chamber 54, and the outlets of both collector units may be coupled to a common exit conduit 58 (conveniently flexible) which by means of a suction pump or fan 60 continually withdraws the punch confetti as soon as formed. The intersection 62 between the body of the (rotating) female dles 23, 25 and the outer (stationary) ring 44 need not be a close fit or in frictional engagement as long as it does not allow the confetti to pass outward therealong. It will be realized also that external air will continually be drawn into the vacuum line 58 thrus the female die openings which are not at the moment plugged by a stud 30. Alternately, the bearing sleeve 50 may inwardly be supported directly on the shaft 16 and the inner ring 40 omitted.

After the (printed) paper is drawn through the assembly of FIGURE 1, it may be passed between subsequent (conventional) rollers which score or slit-perforate the sheet along transverse lines 64 for folding or severance; and/or another one or more series of rotary punch dies—having different spacing such as will form file holes 66, FIG. 4—may similarly act on the moving sheet. The present collector units 38 may similarly be associated with the female members of such additional pairs of rotary dies. While the line holes 32 in business forms may be intended to prepare such forms for use in tabulating machines, it will be appreciated that the present invention is not limited to use with punch dies of any particular spacing or which produce indexing holes for a specifically restricted end use.

By the alternate construction of FIGURES 5–6, there is provided a pair of female dies 23*a*, 25*a* wherein the annular confetti chamber 54*a* which is in open communication with the circle of nipples 34, discharges axially inward instead of outward. Thus the corresponding chamber openings face each other, instead of oppositely as in FIG. 1. Accordingly, a peripherally-opening, annular bearing channel 51*a* serves to retain a bearing sleeve 50*a*. Outwardly disposed about the sleeve 50*a* is fixedly mounted a two-piece, generally coaxial, cylindrical tube 68, 69 of which the outer ends are secured to the respective uprights 10, 12 by corresponding bracket arm 46 and

supporting stem 48. Medially along the shaft 16, the longitudinally aligned and non-rotating, tube segments 68, 69 are coupled together by an outer telescoping construction of the mutually embracing section 70 which is formed with an outlet 56*a* coupled to the suction line 58. Such longitudinal extension and contraction thus allows the same confetti collector unit to accommodate both female dies 23*a*, 25*a* while the latter may be shifted axially along the shaft 16 so as to punch paper strips of different widths (or at varied positions of separation across the same-width paper).

We claim:

The combination of (a) a rotary shaft, (b) a pair of female punch dies coaxially mounted on said shaft and having means for longitudinally adjustable spacing therealong for joint rotation therewith, each die being formed with a circle of radially directed, die openings in inner, terminal communication with a chamber of the die having a lateral, axially-inward facing, generally annular outlet adjacent the shaft, and (c) a stationary, generally coaxial, segmented tubular collector unit disposed about the shaft between said dies with its outer ends in terminal abutment with the respective dies and radially outward from said annular die chamber outlets so as thus to provide a closed chamber between both dies, said collector unit comprising an outer, terminal segment adjacent each die and provided with axially extensible means for attachment of the segments to a fixed support, and the inner adjacent ends of said segments being provided with tubular coupling means and having outlet means for connection of a suction line thereto for continuous withdrawal of punch confetti as formed by and drawn into the female dies, whereby the collector unit can be telescopically retracted and extended to accommodate different axial spacings of the pair of dies along the shaft.

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