

Oct. 3, 1967

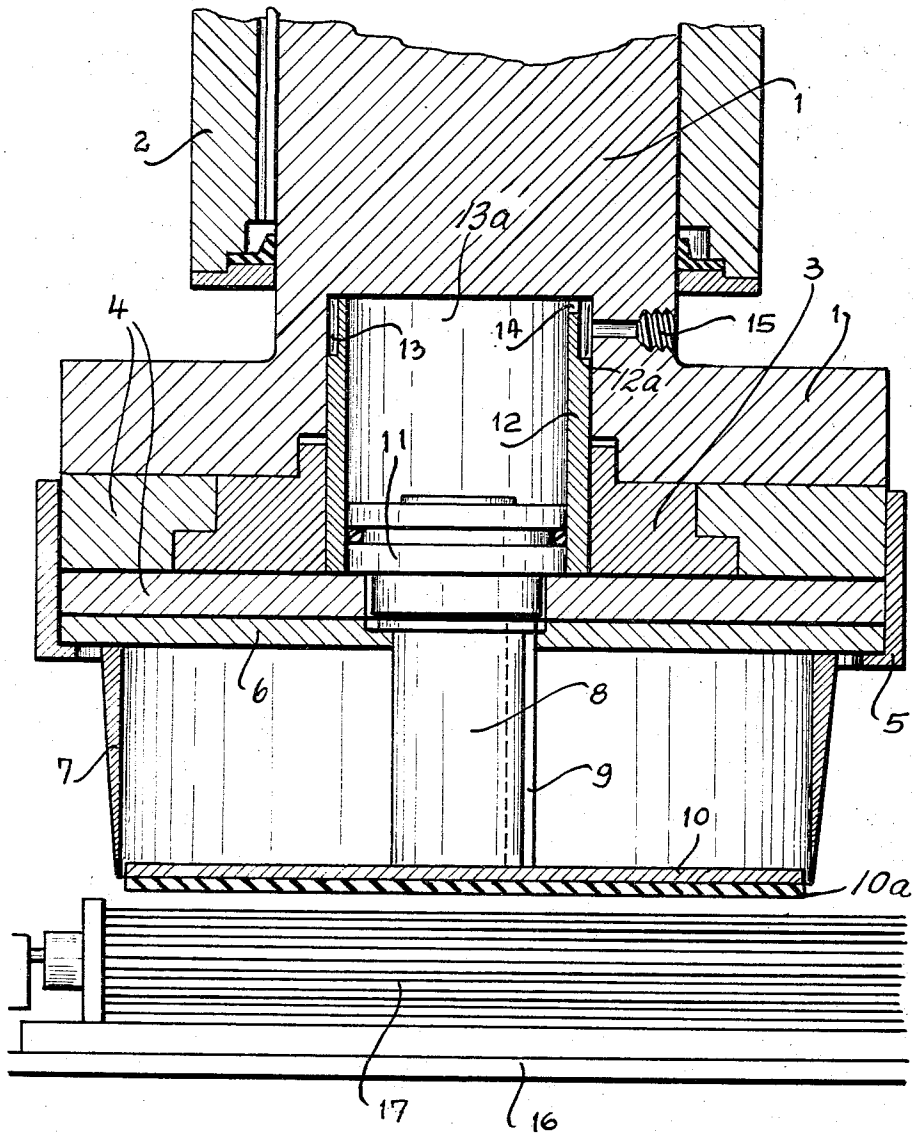
W. SCHNEIDER
PROCESS OF CLAMPING A PILE OF SHEETS
DURING CUTTING THEREOF

3,344,697

Filed Sept. 9, 1964

2 Sheets-Sheet 1

Fig. 1



Oct. 3, 1967

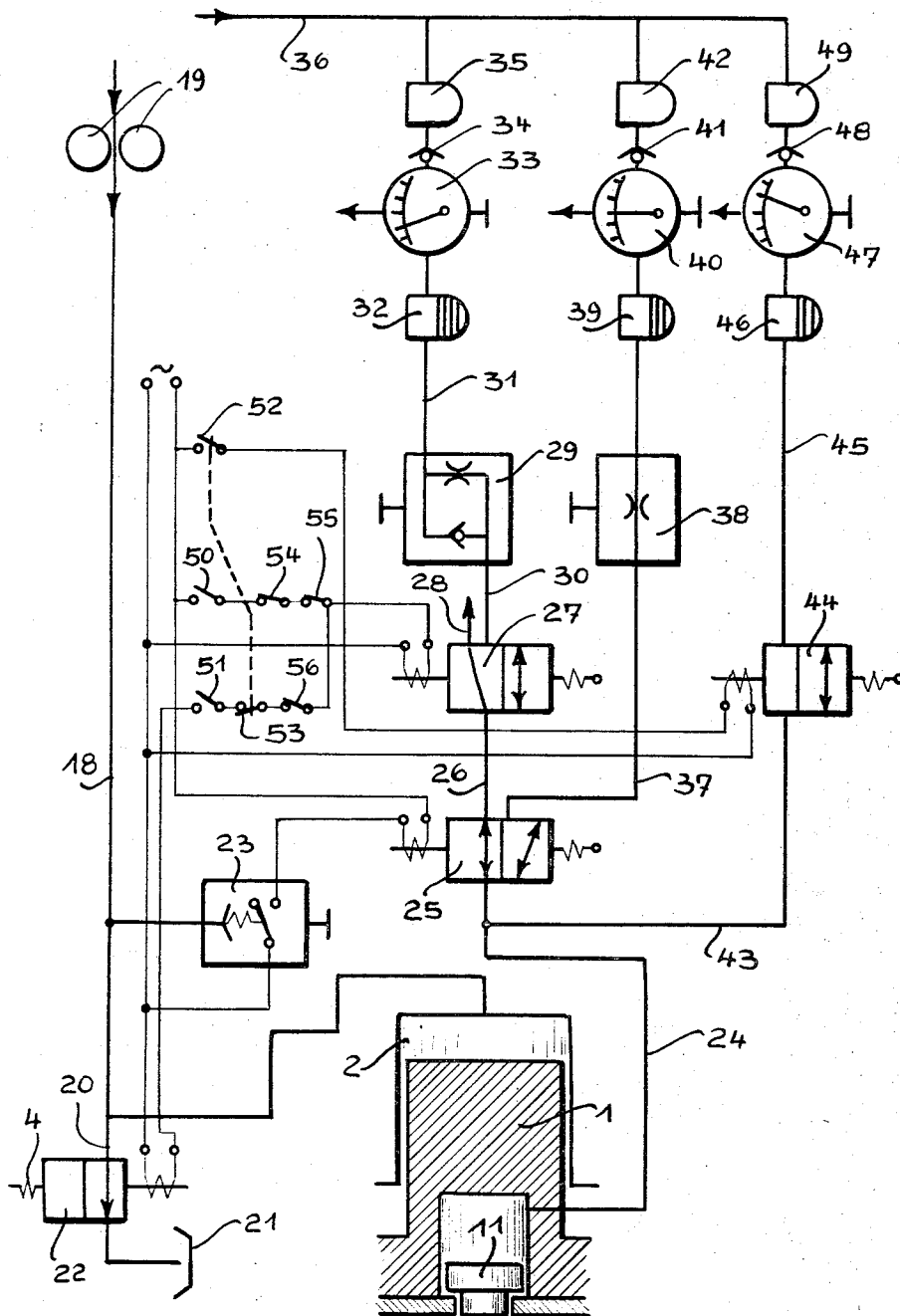
W. SCHNEIDER
PROCESS OF CLAMPING A PILE OF SHEETS
DURING CUTTING THEREOF

3,344,697

Filed Sept. 9, 1964

2 Sheets-Sheet 2

Fig. 2



1

3,344,697

PROCESS OF CLAMPING A PILE OF SHEETS DURING CUTTING THEREOF

Willi Schneider, Adliswil, Zurich, Switzerland, assignor to Frey Wiederkehr & Cie., Aktiengesellschaft, Zurich, Switzerland

Filed Sept. 9, 1964, Ser. No. 395,262

Claims priority, application Switzerland, Nov. 8, 1963, 13,749/63

8 Claims. (Cl. 83—19)

The present invention relates to processes and apparatus for the cutting or punching of sections or blanks from piles or stacks of paper, plastic sheets, textiles and the like.

If a large number of blanks is to be produced simultaneously from a pile or stack of sheets by one cutting operation, differences will result in dimensional accuracy between the top-most and bottom-most blanks.

It is an object of the invention to avoid this disadvantage.

According to the invention this object is accomplished by providing an adjustable pressure or compression which is exerted on the pile to be processed, prior to and during the cutting operation. This measure will insure dimensional accuracy from the topmost to the bottom-most blank.

The present invention also proposes an apparatus for carrying out the process according to the invention, wherein a punch having the same contour as the blank is movably arranged inside the punching tool and is operable by driving means through which an adjustable pressure is exerted on the punch.

An embodiment for carrying out the process according to the invention is illustrated in the accompanying drawing, in which:

FIGURE 1 shows a vertical section through the apparatus, and

FIGURE 2 is a diagrammatic representation of the control mechanism of the apparatus.

Referring to FIG. 1, element 1 is a hydraulic piston or plunger which is vertically movable in a cylinder 2 and which is acted on by springs (not shown) which tend to move said plunger into its upper limit position. The plunger 1 can be moved downwardly by a pressure fluid entering the cylinder 2 from the top (see FIG. 2).

Fixed to the bottom of the plunger 1 is a holding or supporting ring 3, on which a base plate 4 is rotatably positioned, said base plate being provided with a support 5 into which a knife support 6 is inserted, on which a knife 7 is fixed. Suspended in the center of the knife support 6 is a punch 8, a wedge 9 preventing rotation of the punch 8 in relation to the knife support 6. Fixed to the bottom of the punch 8 is a punch plate 10 which carries an elastic covering 10a on the underside.

The members 6-10 form a unit which can be inserted as such into the support or mounting 5. Upon the insertion of said unit, the punch 8 is coupled to a piston 11 which is freely movable in a cylinder 12. The cylinder 12 is seated in a central bore at the bottom end of the plunger 1 and it comprises on the outside at the top a shoulder 12a by which is formed an annular space or chamber 13 which is connected to the inner chamber 13a of the cylinder by a passage 14. A duct 15 leads outwardly through plunger 1 from the annular chamber 13. A compressed-air line described hereinafter is connected to said duct.

FIG. 1 also shows a pile or stack of paper sheets 17 on a table top 16, the blanks being cut or punched from said pile of paper by means of the knife 7.

As appears in FIG. 2, the cylinder 2 is connected to an hydraulic pump 19 by way of a line 18, while a magnetic valve 22 is connected into a line or piping 20 which leads

2

to a sump or pit 21. A regulable push button switch 23 is also connected to the line 18.

A compressed-air line 24 leading to a magnetic valve 25 is connected to the duct 15 (FIG. 1) communicating with the cylinder 12. A line 26 leads from the magnetic valve 25 to a magnetic valve 27 to which is connected a line 28 leading to the outside and a line 30 leading to a regulating member 29. From the regulating member 29 a line 31 leads, by way of a lubricator device 32, a pressure-reducing valve 33 with relief or check-valve 34 and by way of a filter 35, to a compressed-air feed line 36.

In addition, a line 37 leads from the magnetic valve 25, by way of a throttle member 38, a lubricator device 39, a pressure-reducing valve 40 with a check-valve 41 and by way of a filter 42 to the compressed-air feed line 36.

Another line 43 connects the line 24 to a magnetic valve 44, from which a line 45 leads, by way of a lubricator device 46, a pressure-reducing valve 47 with check-valve 48 and by way of a filter 49, to the compressed-air feed line 36.

The contact of switch 23 and the magnet coils of the magnetic valves 22, 25, 27 and 44 are connected to a control source of alternating current by way of contacts 50, 51, 52, 53, 54, 55, 56.

The above-described device operates in the following manner:

Upon switching on the press, the contact 50 is closed. The contacts 54, 55 are closed when the base plate 4 is in operating position. The coil of the magnetic valve 27 is excited when contacts 50, 54, 55 are closed, and said valve is reversed so that compressed air flows from the line 36 by way of the filter 35, the check-valve 34, the pressure-reducing valve 33, the lubricator 32, the control valve 29, the magnetic valve 27, the magnetic valve 25, the duct 15, the annular chamber 13 and the passage 14 into the cylinder 12 and forces the piston 11 and the punch 8 downward.

When the table and the carriage of the press have terminated their motions, the contact 51 closes and the magnetic valve 22 is reversed, so that pressure fluid is pressed by the pump 19 through the line 18 into the cylinder 2, and the plunger 1 moves downward.

During this process, the punch plate 10, the contour of which corresponds to that of the blank to be punched, first impinges on the pile 17 and compresses said pile with a preliminary pressure adjustable by the pressure-reducing valve 33. This has the effect that the air within the pile is forced out, thereby insuring that all layers are in accurately level position when the knife impinges on the pile.

When the knife 7 impinges on the pile 17 the liquid pressure in the line 18 increases and the contact of the switch 23 is closed. By way of this contact, the coil of the magnetic valve 25 is excited and said valve 25 is reversed so that the compressed air is conducted from the line 36 (and instead of via the pressure-reducing valve 33 and the control valve 29) into the cylinder 12 by way of the pressure-reducing valve 40 and the throttle member 38 and that thereby another, lower or higher, pressure act on the pile 17 through the punch plate 10 during the cutting process. Said pressure may be decreased, increased or kept constant during the cutting process, i.e., it can be adjusted as is necessary for accurately cutting the pile from the topmost to the bottom-most layer.

For example, if it results that the blanks become constantly smaller from the top to the bottom layer of the pile, the pressure during the cutting process will be increased correspondingly. This will prevent an undercutting, i.e., an inward deflection of the knife.

As soon as the knife 7 has cut through the entire pile 17, the contacts 52 and 53 are reversed by the plunger 1.

The coil of the magnetic valve 44 is then excited by way of the closed contact 52, and said valve is reversed, so that a pressure is now produced by way of the pressure-reducing valve 47 in the cylinder 12, which is required for the subsequent expulsion of the blanks. The opening of the contact 53 switches off the magnetic valve 22, so that the pressure fluid flows from the line 18 into the sump 21 and the piston 1 is relieved from pressure and is returned by spring force as aforesaid. Since this causes the pressure in the line 18 to be lowered, the switch 23 switches off and the magnetic valve 25 returns to the starting position, while the magnetic valve 27 remains switched on, so that the lines 24, 26 and 30 are connected to each other, the check valve in the control member 29 making it possible for an increased pressure to occur in the cylinder 12 by way of the pressure-reducing valve 47. Upon the return motion of the piston 1, said pressure will expel the blanks from the knife 7. The plunger can now be moved to another place, and the operation can be repeated.

As already described, the above-described apparatus comprises three different pressure stages which are switched on and off by the magnetic valves 25, 27 and 44. There may also be less pressure stages. For example, if no special pressure stage is required for the expulsion, the stage in question, i.e., the magnetic valve 44 and the pressure-reducing valve 47, may be dispensed with. It is sometimes possible to operate with a single regulable pressure stage, in which case the control mechanism could be further simplified by omitting the press switch 23, the magnetic valve 25 and the associated pressure-reducing valve 40 and the throttle member 38.

Instead of feeding compressed air to the cylinder 12 for actuating the piston 11, a pressure fluid may be fed to the cylinder. For example, the piston 1 may be provided with a thin calibrated central bore, through which pressure fluid flows from the cylinder 2 into the cylinder 12 and an outlet may be connected to the duct 15, to which outlet may be connected one, two or three control or safety magnetic valves which can be controlled in the same manner as the magnetic valves shown in FIG. 2.

Instead of being actuated by means of the piston 11 put under pressure by compressed air or a pressure fluid, the punch 8 may also be actuated by an electromagnet, in which case the adjustable pressure, possibly adjustable at two or three stages, exerted on the punch plate 10, can be set by changing the voltage applied to the magnet.

What is claimed is:

1. A process for cutting sections out of a stack of

sheets by means of forcing a cutting knife through said stack, said process comprising applying a first pressure to the top of said stack prior to applying the knife thereto, applying the knife to said stack, and applying a second pressure to the stack when the knife has moved a predetermined distance and independently of the pressure of the knife to assure the dimensional consistency of said sections throughout said stack.

2. A process as claimed in claim 1, wherein the knife is in the form of a closed ring, the process further comprising exerting the pressures on the stack within the confines of said ring.

3. A process as claimed in claim 2, wherein those portions of the sheets within the ring tend to remain therein after the cutting of the sheets, the process further comprising exerting a pressure on the stack within the ring to expel said portions.

4. A process as claimed in claim 1, wherein said second pressure is greater than the first.

5. A process as claimed in claim 1, wherein said second pressure is less than the first.

6. A process as claimed in claim 1, wherein the control is effected when said knife has moved sufficiently to engage said stack.

7. A process as claimed in claim 1, comprising continuing to maintain pressure against the stack while the knife is being withdrawn therefrom.

8. A process as claimed in claim 7, comprising commencing removal of pressure from the stack before the knife has completed its return stroke to its initial position.

References Cited

UNITED STATES PATENTS

| | | | |
|-----------|---------|----------------|----------|
| 1,028,920 | 6/1912 | Wadhams | 83—380 |
| 1,522,795 | 1/1925 | Van Valkenburg | 83—19 |
| 1,617,511 | 2/1927 | Balch | 83—19 |
| 2,122,186 | 6/1938 | Southworth | 83—378 |
| 2,215,643 | 9/1940 | Gorham | 83—137 |
| 2,346,100 | 4/1944 | Wright | 83—378 |
| 2,570,873 | 10/1951 | Seybold | 83—378 |
| 2,579,940 | 12/1951 | Lobrovich | 83—137 X |
| 2,704,125 | 3/1955 | Taylor | 83—137 |
| 2,776,540 | 1/1957 | Kraujalis | 83—137 |
| 3,054,317 | 9/1962 | Castle | 83—390 |
| 3,107,567 | 10/1963 | Lindner | 83—380 X |

ANDREW R. JUHASZ, *Primary Examiner*.

FRANK T. YOST, *Examiner*.