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Keyes et al.

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[54] **DIE ASSEMBLIES**

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[52] **U.S. Cl.** **83/99**, 83/123, 83/690

[51] **Int. Cl.** **B26d 7/18**

[58] **Field of Search**.....83/98, 99, 123, 690

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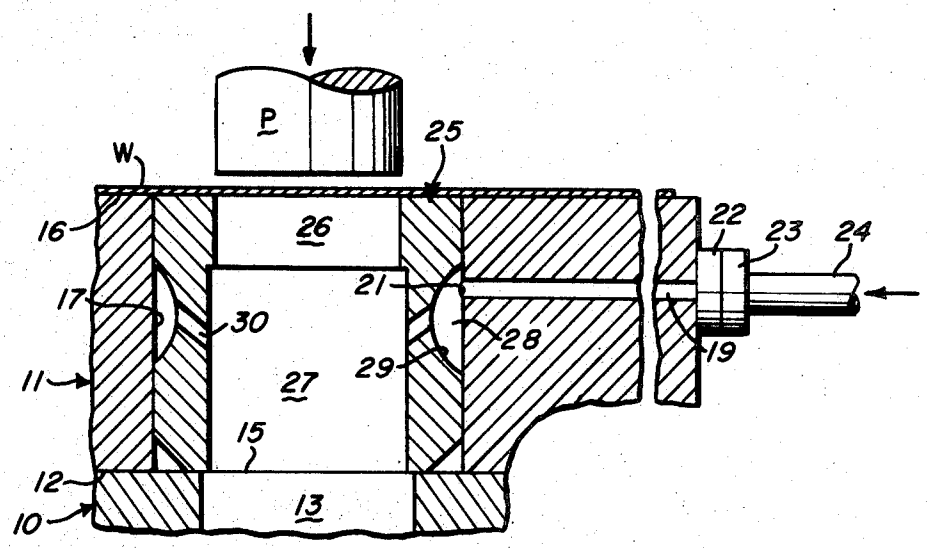
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[57] **ABSTRACT**

A unique die button and die plate providing an improved die unit utilizing a pressured flow of air to more effectively cleanse the working area of a die assembly. Inclined air-flow passages are provided such that they extend through the die button wall in a direction to produce a whirlpool effect to move cut material through the die bore.

17 Claims, 5 Drawing Figures



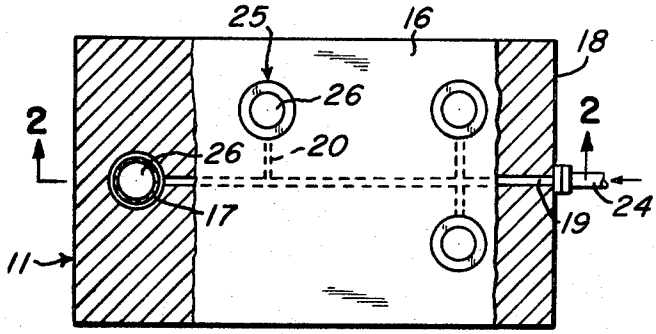


FIG-1

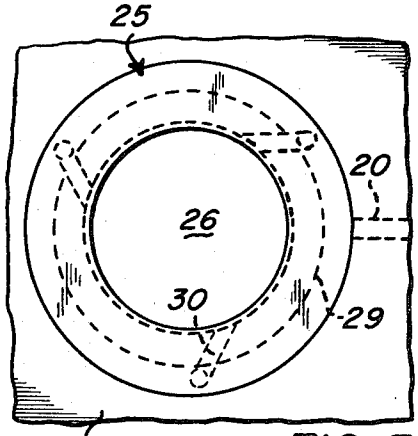
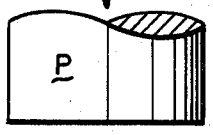
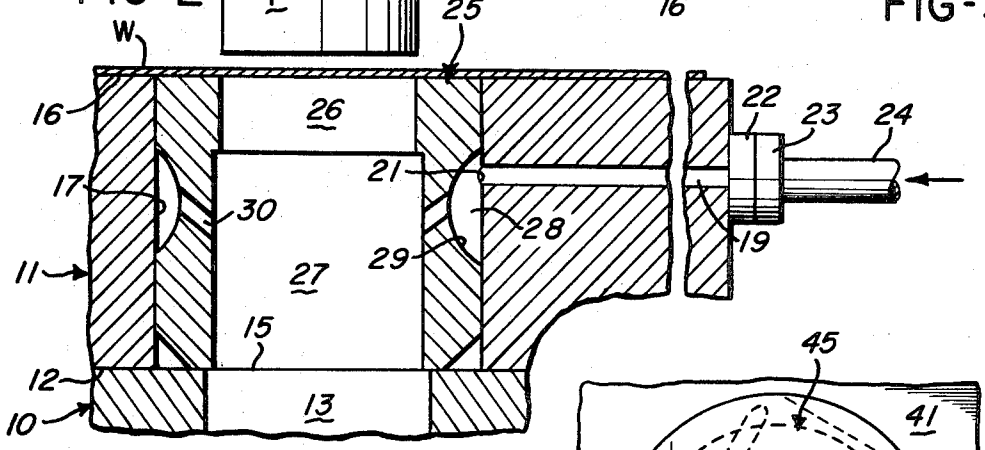


FIG-3

FIG-2





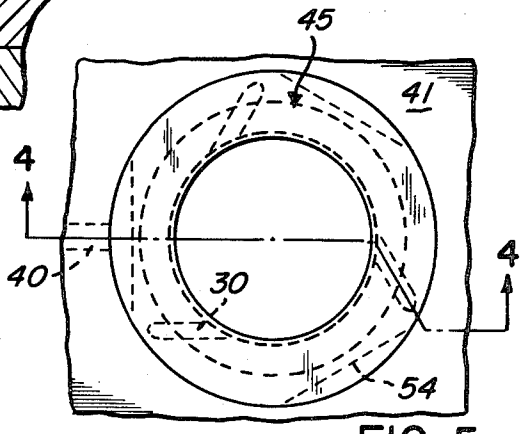
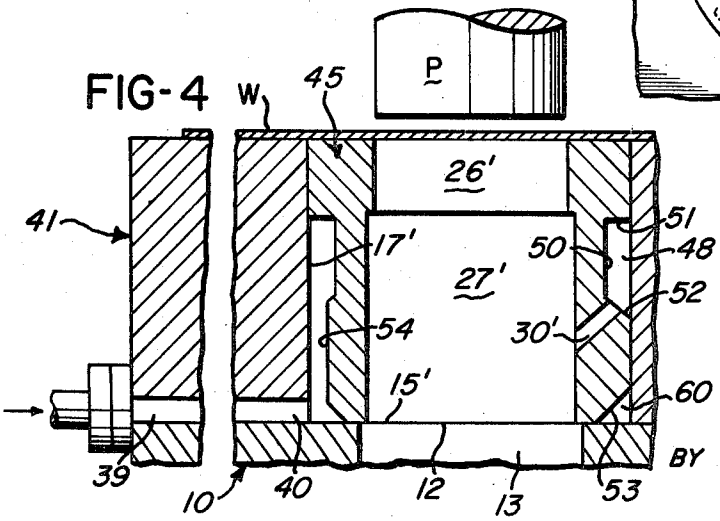


FIG-5

FIG-4



BY

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DIE ASSEMBLIES

BACKGROUND OF THE INVENTION

This invention relates to improvements in die assemblies directed to maintaining their working areas and working tools free of slugs, chips, shavings and loose particles of any sort. It features unique die buttons and an improved die plate complementarily formed to provide a lower die unit wherein a pressured flow of air may be simultaneously or selectively directed immediately adjacent working areas and tools to positively draw therefrom the adherent particles normally resulting from a cutting, punching or other product forming operation.

At a minimum, a die assembly includes upper and lower die units normally fixed, respectively, to upper and lower die shoes. The upper die unit mounts cutting tools which, in operation, are advanced to engage and cut, punch or form a work piece based on the lower die unit. The latter incorporates passages defined by die buttons, which passages are intended to align with the tools and, hopefully, pass slugs or other particles separated from a work piece.

What actually happens in the process is that the operating ends of the tools project in or to the die button passages in cutting a slug. Many times slugs tend to adhere to the tools, plug die buttons, and prevent passage and full evacuation of slugs, chips, shavings and the like. If this occurs, it can affect timing of the cutting operation. Even more serious, the failure to properly clear the lower die unit and its die buttons produces a condition which could cause misalignment and damage of tools, malfunctions, poor work products and other disastrous effects.

Industry has been seriously afflicted with the above noted problems, to one degree or another, for a considerable period of time. As a result, there have been many efforts to correct the objectionable conditions which have produced the problems. Among the best solutions presented to date are those which provide for the utilization of an applied vacuum. However, even these solutions have been less than satisfactory. These as well as other proposals present only partial solutions to the problem in that they are generally characterized by limited efficiency and difficulties in implementation and application. Moreover, their cost factor is many times quite significant.

SUMMARY OF THE INVENTION

The present invention utilizes pressure and vacuum but, by contrast to prior art devices directed to similar purposes, is simple in its structural embodiment, inexpensive to adopt, and most effective in use. It provides a die plate having a main intake passage into which may be plugged the delivery end of a line from any conventional available source of air under pressure. Leading from this main intake passage are branches, each of which opens to a through aperture in the die plate, in which aperture is press fit the tubular die button. In accordance with the invention, the die buttons are uniquely formed to receive and direct the air channelled through said branches under pressure to exit within and produce in the upper end of the die buttons the effect of a strong whirlpool. This effect is so located and of such a nature to induce a positive displacement of slugs, shavings and other particles from adjacent surface areas to which they tend to adhere. The net result is to minimize, if not to generally obviate, the problems above noted to which the invention is directed.

It is therefore a primary object of the invention to provide improvements in die assemblies enabling them to be economically fabricated, more efficient and satisfactory in use, more versatile in application, and less susceptible to malfunction.

Another object of the invention is to provide uniquely improved die buttons for use in die assemblies.

A further object of the invention is to provide in a die plate embodying die buttons a complementary forming thereof enabling the simple and selective application therein of a pressured flow of air in a manner to maintain working areas of the die plate clear of particles which may be detached from a superposed work piece.

An additional object of the invention is to provide a system for maintaining the working area of a die or like assembly clear utilizing individual, replaceable, die buttons constructed to direct a pressured flow of air to create within the die buttons and apply to areas adjacent thereto a whirlpool effect capable of detaching free particles which tend to adhere to adjacent surfaces.

Another object of the invention is to provide a die unit of the class described and improved die buttons therefor possessing the advantageous structural features, the inherent meritorious characteristics, the reliability of range and mode of operation and the method of use herein described.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the drawings wherein some but not necessarily the only forms of invention embodiment are illustrated,

FIG. 1 is a generally diagrammatic fragmentary view of a lower die unit embodying the concepts of the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1 and illustrating details of a die button in accordance with the invention;

FIG. 3 is a fragmentary top view of the structure illustrated in FIG. 2, highlighting certain details of the die button; and

FIG. 4 is a view similar to that shown in FIG. 2 but illustrating a different embodiment of the invention, taken on 4—4 of FIG. 5.

Like parts are indicated by similar characters of reference throughout the several views.

As noted previously, the invention relates to improvements in die assemblies but more particularly the lower die unit. For this reason, only the lower die unit is shown in detail in the drawings. The remainder of the die assembly is not illustrated since in and of itself it forms no part of the invention and may be of any conventional nature well known to those versed in the art.

As seen in the drawings, the lower die shoe **10** acts as a support and a mount for a releasably attached die retainer plate **11**. Bolts or other suitable fastening means may be used to releasably hold the plate **11** to a

firm seat on the upper planar surface **12** of the shoe **10**. As seen in FIG. **1**, at each of several working positions of the die assembly, as defined by the nature and number of the cutting tools utilized in connection with the upper die unit, the shoe **10** is suitably machined, as by boring, to form therein vertical through passages **13**. The latter extend perpendicular to and open at their upper ends from the surface **12**.

The die retainer plate **11** has a planar undersurface **15** adapted to seat closely in abutting relation to the surface **12** of the die shoe **10**. Similarly the plate **11** has a flat planar upper or outer surface **16** over which work pieces W may be advanced in either a continuous or with an incremental feeding motion. In coaxial alignment with each related cutting tool the plate **11** has a through aperture **17** defining a working position of the lower die unit and opening to a coaxial passage **13** in the die shoe **10** therebelow.

With particular attention to the diagrammatic showing of FIG. **1** of the drawings, it is there seen that the plate **11** is provided with a bore opening from one edge **18** thereof defining a main intake passage **19**. A plurality of extensions or branches **20** communicate at one end with the passage **19** and each separately opens at **21** to a separate individual aperture **17**. In the case of the embodiment illustrated in FIGS. **2** and **3** of the drawings, the opening **21** from the intake passage **19** is in relatively closely spaced adjacent relation to the upper surface **16** of the plate **11**. Defining the entrance to intake passage **19** is an adapter **22** suitably fixed to the edge or side **18** of the plate **11**. The adapter will preferably be of the type to afford a means for a quick coupling thereto of a mating adapter **23** on the discharge end of an air supply hose **24**. The quick connect-disconnect type of coupling afforded by the adapters **22** and **23** may be any one of the available mechanical expedients well known to mechanics in the art.

In accordance with the invention, therefore, one can apply in the passage **19** and its branches or extensions **20** a pressured flow of air merely by connecting to the adapter **22** an air hose leading from a normally available supply of compressed air which may be generally utilized otherwise in the industrial establishment where the invention is employed. There is no special apparatus necessary or special adapters which must be physically employed as a special and extra cost item referenced to a single die assembly in accordance with the invention.

As noted previously the die unit here illustrated in a generally diagrammatic form is used as part of a complete die assembly wherein the upper die unit will mount tools such as punches adapted to reciprocate therewith and perforate a work piece presented on the lower die unit as a base. FIG. **2** illustrates a single working position of the lower die unit as defined by an aperture **17** and for purpose of description and understanding of the invention there shown in association therewith the cutting end of a punch P as it approaches the work piece in the function thereof.

Referring now more particularly to FIGS. **2** and **3** of the drawings, press fit in each aperture **17** in plate **11** is a die element or button **25**. The latter is formed with a generally cylindrical configuration and is designed to have a length that, when properly inserted, its flat planar ends will lie respectively in the planes defined by the plate surfaces **15** and **16** of plate **11**. It will be obvious that by reason of its press fit nature, as an individual die button becomes worn or the character of the work to which the die assembly is applied changes, the die button may be simply replaced. The die button will in any event have a through bore **26** positioning coaxial, in the illustrated instance, with a punch P and with a passage **13** in the die shoe **10** therebelow. Attention is directed to the fact that the bore **26**, at its end positioning adjacent the passage **13**, will be counterbored. The counterbored portion **27** so provided will extend, for example, approximately three-quarters of the length of the bore **26** and will have a diameter increased slightly relative thereto but slightly less in dimension than the diameter of the passage **13** in alignment therewith. Thus, the portion of the bore **26** uppermost and immediately underlying the work piece W will be dimensioned to matingly accommodate the dimension of the related punch P which in operation thereof will descent on the work piece and cut therefrom a slug which will be carried thereby into the accommodating bore **26**. The expansion provided by the counterbore **27** gives slightly greater freedom to the slug as it is pushed inwardly of the bore **26** by the punch P. The importance of this will soon become obvious. Of course the passage **13** provides a means for any particle delivered through the bore **26** to exit to a waste receptacle or collector means (not shown).

To understand the importance of the invention, it should be realized that in operation of the cutting tools on the work piece W at the various working positions defined by the tools and the die buttons there will be presented with or in conjunction with the tools lubricant and, with the cutting operation, slugs, chips, shavings and dustlike particles resulting from the operation on the work piece by the tools such as punch P shown. If on each movement and working operation of the punch or punches therefor there is no means for eliminating this debris so provided, on the next operation of the cutting tools and any movement of the work piece, there will be distortion of the position of the work piece, damage to the work piece in operation of the tools and potential damage to the tools due to the stress placed thereon by the existing debris. The invention is of course directed to obviating such problems.

Looking now to the outer periphery of the die buttons **25**, it will be seen in FIG. **2** that there is milled in the outer wall surface of the die button, towards the upper end and circumferentially thereof, a groove **28** the base **29** of which is uniformly arcuate in cross section. It will be noted in FIG. **2** that the upper edge of the groove coincides generally with the shoulder defined by the counterbore **27** in the bore **26**, which shoulder is in closely spaced adjacent relation to the surface **16** of the die retainer plate **11**. Attention is also directed to the fact at this point that a branch **20** of the air intake passage **19** in the plate **11** will open to the groove **28** closely adjacent its upper end. Further formed in the wall of the sleeve-like die button **25**, in this instance, are three circumferentially spaced port-like passages **30**. The passages **30** open at one end to the groove **28**, adjacent the upper end thereof on a level immediately below the discharge end **21** of an air-flow passage **20**. Moreover, the passages **30** are

directed to open in a sense substantially tangential to the wall defined by counterbore **27** and in a sense inclined downwardly thereof towards the bottom or inner end of the button.

It will therefore occur, on application of a flow of air under pressure through the intake passage **19** and the branches **20**, that, in respect to each die button such as illustrated in FIG. **2**, the air under pressure will exit in jet form at the opening **21** to the groove **28** circumferentially of a button **25**. In exit of the jet of air from the opening **21** it will impact on the arcuate base **29** of groove **28**, swirl about the button and in the groove **28** and exit to the interior of the button **25** by way of passages **30**. Thus, compressed air which is plugged into plate **11** will immediately flow to the location of each die button **25** and move to the interior thereof in a compound motion in which air streams about the button first in the groove **28** and then interiorly in an angularly downward and tangential motion in exit to the bore **26**. In exit of the series of the three jets illustrated issuing from the passages **30**, the jets will be peripherally guided by the wall defined by counterbore **27**. There will be produced thereby supplementing air streams having a downward inclination and at the same time a strong rotary component of movement causing a whirlpool effect the center of which is the button axis. As will be seen, this whirlpool is produced adjacent the upper end portion of the bore **26** and the jets of air so functioning will have a plural effect. The center of the whirlpool produced creates a suction effect. As the punch P penetrates a work piece W and drives a slug from the work piece into the bore **26**, space is provided about the slug due to a predetermined inherent clearance so that with this suction ambient air is drawn through the cut opening in the work piece and into the die button and the center of the whirlpool. This dictates that dust particles, chips and shavings produced in the cutting process are sucked or drawn down with and about the slug into and into the dispensing whirlpool. Simultaneously, as the punch together with the cut slug in advance thereof enters the upper end of the bore **26** and moves inwardly to the upper end of the counterbore **27**, the pressured flow of incoming air produced in the whirlpool will actually positively pick up and affect the cut slug and serve to influence a positive detachment of the slug from the punch P to a degree above and beyond the capabilities of the whirlpool. Thus, the total effect of the movement of air under pressure, the whirlpool produced in the die button and the ambient air drawn down thereby is that slugs and particles tending to attach to the punch P are positively removed in the process of the punching and cutting operation and simultaneously there is drawn from the periphery of the die button per se and the work area of plate **11**, as well as the work piece W, loose particles which tend to adhere thereto together with any excess lubricant that may adhere in the course of the cutting process. Of course, as will be obvious, the centered whirlpool suction effect will expedite the discharge of the slug and all debris entrained in the whirlpool by way of the passage **13** which forms the continuation of the adjacent bore **26**.

Depending on the particular application, the internal passage provided by each die button **21** may be of different size according to the character of the work being done. In some instances, depending on the application, the whirlpool producing passages **30** will vary in number. In any instance, however, it is desirable and preferred that the position within the die button at which point the whirlpool is created in the counterbore **27** should be at a point where there may be produced an extended depth of the whirlpool. It will be obvious, of course, that the related passage **13** may be utilized to extend the whirlpool effect and that the depth of the effect and correspondingly the drawdown power thereof will be in direct relation to the pressure and velocity at which air is delivered under pressure by way of the passage or passages **30** opening to the interior of the die button.

FIG. **1** of the drawings diagrammatically illustrates a plurality of working positions in a die assembly. It may be, however, that in a particular instance only a single die position such as illustrated in FIG. **2** will be utilized for the work to be accomplished. In such case, the plate **11** may be provided with a single aperture **17** and a press fit die button **25** as illustrated with which the plate passage **19** may communicate. In the alternative, a plate having multiple working positions such as shown in FIG. **1** may be utilized and in such event those working positions not utilized may be plugged by a conventional die button or insert. Thus, a die retainer plate having multiple working positions may be variably utilized and air under pressure selectively directed only to those die buttons where the situation requires.

It will be clear from the foregoing that having available the die retainer plate **11** the same may be utilized with conventional buttons or with invention type buttons and in such cases where air under pressure is required, one need only plug in to the adapter **22** defining the main intake passage **19** the delivery end of a hose leading from a conventional source of supply of air under pressure such as that utilized industrially for spray cleaning and the like.

FIG. **4** of the drawings illustrates a modification of the die retainer plate and die button concept of the invention shown in FIGS. **2** and **3**. The die shoe **10** will be formed as previously described and the pertinent portions thereof are identified by the same numbers as utilized in reference to the previously described embodiments of the invention. The difference in reference to the die retainer plate is that in this instance the plate; identified as **41**, had formed in its undersurface **15'**, which positions in abutting superposed relation to the surface **12** on the die shoe **10**, a milled groove or slot **39** forming with portions of surface **12** a main air intake passage **39** for the plate. Similarly formed in the surface **15'** are branches or extensions **40** of the main intake passage **39**. The terminal portion of each branch **40** opens to one of a plurality of apertures **17'** formed in the working positions of the die plate. It will of course be obvious that in this embodiment of the invention, equally as in the instance first described, the surface **15'** of the die retainer plate and the abutted surface **12** of the die shoe must mate in sealing relation.

The apertures **17'** accommodating the die buttons in the plate **41** will be formed and positioned as basically required for the range of the application of the plate.

In the showing in FIG. **4**, the die button **45** utilized is a modification of the die button **25**. The interior of the die button **45** is formed identically as that of the die

button 25, being provided with a bore 26' and a counterbore 27', the latter being of a depth equal to that provided in the case of the counter bore 27. In this instance the outer periphery of the sleeve-like button 45 has a circumferential groove 48. The latter is positioned generally as the groove 28 but its cross section is different. In this case the inner or base portion of the groove 48 has a definite cylindrical configuration providing a surface 50 concentric with the outermost and innermost peripheral wall portions of the die button. At the upper limit of the groove 48 the limit of the base portion 50 is defined by an annular shoulder 51 defining a plane transverse to the longitudinal axis of the die button and one which is almost common with the plane defined by the shoulder produced by the inner end of the counterbore 27'. The lower limit of the groove 48 is defined by an annular shoulder 52. The latter has a generally conical configuration and expands in a sense downwardly of the die button 45. At its lowermost extremity, which abuts the surface 12 of the die shoe 10, the outer peripheral surface of the die button is cut back to a conical form by a chamfer 53. The latter is circumferentially continuous so that when a die button is inserted in the plate 41, such as shown in FIG. 4, there is produced a space 60 about the outer periphery of the die button at its bottom which communicates with a related air passage 40, as illustrated.

Defined at circumferentially spaced locations on the outer periphery of the sleeve-type die button 45, in longitudinally extended surface portions thereof between the chamfer surface 53 and the shoulder 52, are flats 54. As may be seen, these flats 54 define, with the wall of aperture 17', passages which afford a direct communication between air passage 39-40 and the circumferential groove 48 in the outer periphery of the die button.

The die button 45 has passages 30' formed in the walls thereof similar to passages 30 of the die button 25. The passages 30' in this case open at one end through the shoulder 52 and are so angled, both downwardly and inwardly, to open in the wall defined by the counterbore 27' so as to discharge in a sense downwardly of the die button and in a sense generally tangential to the wall of the counterbore.

It will be self-evident that in the use of the modification of the invention as illustrated in FIG. 4, there will be produced as in the instance first described a whirlpool effect having essentially the same results. The plate 41 will have an adapter applied to define the inlet to the intake passage 39 serving as a quick connect device for a conventional air hose delivering air under pressure. Further, upon application of the air hose, as and when required, a pressured flow of air through the passage 39 and its extension or extensions 40 will produce circumferentially of the related die buttons 45, in the groove 48, a whirling flow of air under pressure which will be forced inwardly of the passages 30' to exit within the die button and create the whirlpool effect as previously described. In this second described embodiment of the invention the level at which the whirlpool will be effected will be slightly lower in the die button but will generally serve equally as well as in the first instance for many ordinary applications. The prime benefit of the fabrication of the die retainer plate in the manner as described with reference to the plate 41 is a simplicity of manufacture of the retainer plate. In the instance first described, for some applications the formation of the branch passages might of necessity, for the particular application, be somewhat more expensive.

It is of course obvious that the air channels in the plate 11 might be formed in the bottom surface 15 such as described with reference to the example shown in FIG. 4. The only modification necessary in such case, in respect to the die button as shown in FIGS. 2 and 3, would be the formation of vertical grooves in the outer surface portions of the die button 25 between the circumferential groove 28 and the chamferred surface 33 on the bottom of the die button adjacent the die shoe 10, about its outer periphery.

In summary, there has been schematically and diagrammatically illustrated how the invention concepts may be incorporated in a lower die unit and in its constituent parts, that is the lower die plate and the incorporated die buttons. The various features illustrated may be used in combination and in alternate fashion to suit the needs of the particular situation.

For maximum simplicity the die button 25 could be provided, between its groove 28 and bottom chamfer 33, with flats and such button could be utilized with a die retainer plate such as 41 in an obvious manner.

In any case the die retainer plate will be formed complementary to the invention die buttons and the air passages therein may be created by any suitable forming of the retainer plate, a variety of procedures enabling the same being well known to the mechanics versed in the art. It may be that where the working positions of the die retainer plates of the lower die unit are of such number and so complex that a single intake passage is inadequate. In such case there may be plural intake passages connected with a selective plurality of working positions and die buttons, in each of which air under pressure may be provided simply by plugging in a hose.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. In a die assembly wherein a die plate disposes in opposing relation to punch or like cutting or forming means in support of an intermediately positioned work piece, at least one die button installed in said plate having a longitudinal bore cross sectionally dimensioned at one end to receive corresponding punch means and open at its opposite end to allow material cut from the work piece by entry of the punch means therein to

move through said bore and discharge from said opposite end and means for directing interiorly of said bore through said button intermediate the ends thereof a pressured flow of air, said directing means including passage portions so orienting the flow on discharge to produce in said bore a whirlpool effect operative to pressure move cut material from adjacent said punch means and the vicinity of said bore and to induce the discharge thereof through said opposite end in continuing fashion.

2. A die assembly according to claim 1 characterized by said directing means including at least one passageway defined in said die plate adapted for communication with a source of air under pressure and open to said die button, said directing means further including at least one passage from the exterior to the interior of said die button arranged to discharge tangentially to the wall of said die button defining said bore.

3. A die assembly according to claim 1 characterized by said die button being a unitary device and said directing means being a passage through the wall of said die button opening generally tangential to the inner surface thereof and in a direction inclined to said opposite end thereof.

4. Apparatus as in claim 1 characterized by said die button having in the wall thereof circumferentially spaced through passages communicating its exterior with the interior of said bore and providing said directing means, said through passages being positioned to open relatively adjacent said one end of said bore and to discharge air under pressure generally tangential of the wall of said bore and produce therein a descending whirlpool effect facilitating the discharge of cut material and attendant debris.

5. Apparatus as in claim 1 characterized by said die button having a generally cylindrical form and being press fit in an aperture in said die plate for ready replacement, the outer periphery of said die button having formed therein an annular groove for receiving about said die button, circumferentially thereof, a pressured flow of air and said directing means including one passage opening at one end from said groove and at the other end to the interior of said bore.

6. Apparatus as in claim 5 characterized by means defining an air flow channel in said die plate in communication with said groove by virtue of the positioning of said die button.

7. Apparatus as set forth in claim 6 characterized by there being a plurality of air flow channels formed in said die plate adapted to be simultaneously and selectively connected with the respective die buttons in said plate.

8. Apparatus according to claim 1 characterized by said directing means including means defining a surface channel in said die plate adapted for the quick connection to one end thereof of a pressured flow of air and said die button having communicating passageways for directing the pressured flow of air to the interior of said bore in a manner to form said whirlpool.

9. A die assembly according to claim 1 characterized by said die plate being adapted to have one surface thereof seat to a die shoe and form therewith an air channel for delivery to said die button of a pressured flow of air, said die button having a depth corresponding generally to the thickness of said die plate and the said opposite end thereof seating on said shoe, further passage being defined peripherally of said die button between said die button and said die plate for continuing the direction of said pressured flow of air and there being angled passages through the wall of said die button opening in circumferentially spaced relation thereabout, intermediate the ends thereof, to produce a continuous self-propagating whirlpool effect interiorly of said bore.

10. Apparatus as set forth in claim 1 characterized by said die plate having therein at least one inlet passage a portion of which terminates at said die button and opens thereto adjacent said one end of said bore, said inlet passage being defined at its outermost end by a quick connect adapter for applying thereto the discharge coupling of a lead from a source of compressed air, said die button having in the outer periphery thereof a recess to which said inlet passage discharges and a passage being formed in the wall of said die button to open at one end from said groove and from the other end generally tangential to the interior wall defined by said bore in a manner to direct a pressured flow of air to produce said whirlpool and function to positively dislodge from said punch and the vicinity of said bore and work piece cut material and debris attendant the cutting operation.

11. A die unit comprising a die plate including means defining at least one channel for introduction thereto of a flow of fluid under pressure, at least one aperture in said die plate defining a working station therein, said channel communicating with said aperture, a die button press fit in said aperture for ready replacement and having a through bore and at least one non-radial passage communicating with said through bore and the first-mentioned channel to provide for a direct and pressured flow of air to produce within said die button bore a positively functioning whirlpool operative to positively displace and to draw through said bore cut materials and fluids which tend to adhere to surfaces adjacent or in the vicinity of said bore.

12. Apparatus as in claim 11 characterized by a recess in the periphery of said button providing a pocket to which said channel opens and from which said passage opens to discharge to said bore in a sense downwardly thereof.

13. A die button comprising a tubular sleeve-like element having inlet and outlet ends in relation to movement of materials into and through said element and having further at least one non-radial passage opening at one end to its exterior and opening at the other end to the interior thereof while inclining between its ends toward the outlet end of said element whereby on passage of air through said non-radial passage under pressure from the exterior to the interior of said element the air will be directed toward said outlet end in a swirling motion about the inner wall of said sleeve and produce a whirlpool effect reflected the length thereof.

14. A die button as in claim 13 wherein said tubular sleeve-like element has in the outer surface thereof a recess and said non-radial passage opens at its outermost end within said recess which defines a pocket for the introduction to said sleeve-like element of a pressured flow of air in communication with said non-radial passage.

15. A die button as set forth in claim 13 characterized by a groove circumferentially of said die button and there being a plurality of said non-radial passages leading therefrom to the interior of said sleeve-like element to mutually produce said whirlpool effect.

16. Apparatus as set forth in claim 15 characterized by each said non-radial passage opening generally tangential to the interior wall surface of said sleeve element.

17. Apparatus as in claim 16 characterized by means defining at least one longitudinally extending cut in the outer surface of said sleeve for first directing air under pressure thereby to said groove for passage to the interior of said sleeve element.

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