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Perry

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[54] MACHINE FOR FINISHING SURFACES

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[73] Assignee: **Dynetics Corp.**, Woburn, Mass.

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[21] Appl. No.: **179,629**

[52] **U.S. Cl.** ..... **51/2 R**, 51/317

[51] **Int. Cl.** **B24b 7/00**, B24b 9/00

[58] **Field of Search** ..... 51/2 R, 2 A, 2 H, 51/2 M, 2 K, 2 UA, 317

[56] **References Cited**

UNITED STATES PATENTS

3,634,973	1/1972	McCarty	51/2 R
2,419,687	4/1947	Luckey	51/2 R
3,039,234	6/1962	Balman	51/2 R

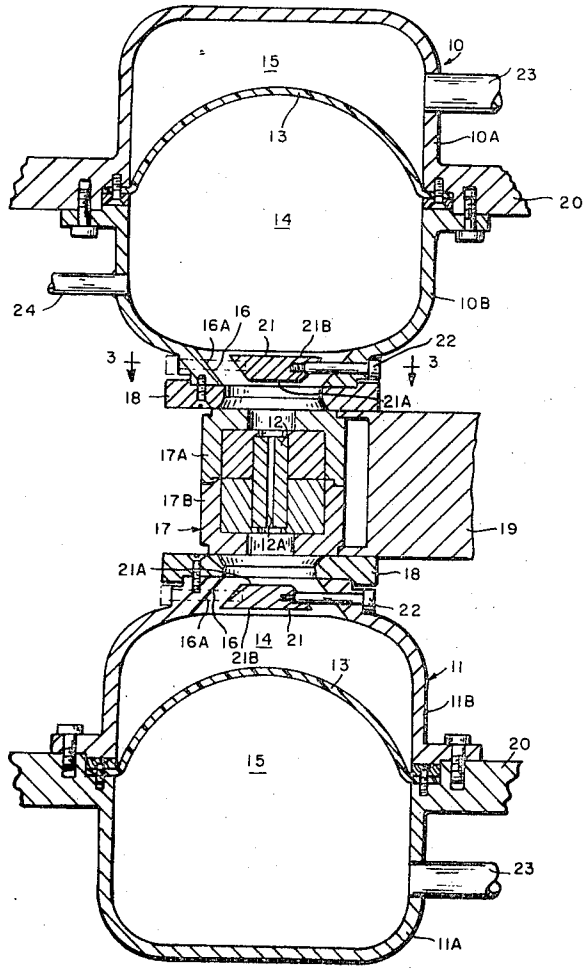
Primary Examiner—James L. Jones, Jr.

Attorney—Sewall P. Bronstein et al.

[57] **ABSTRACT**

A machine including two hollow members, each divided into two chambers with a diaphragm being the divider between the chambers, one of the chambers of each of the devices adapted to receive fluid to push the diaphragm in a direction to force abrasive material adapted to be held in the second chamber through an orifice extending outwardly from the second chamber, and a baffle positioned in the orifice to prevent expansion of the diaphragm through said orifice and to direct the flow of abrasive material into said second chamber when said hollow members are positioned to cooperatively move abrasive material through a workpiece held between the orifices of said members.

10 Claims, 5 Drawing Figures



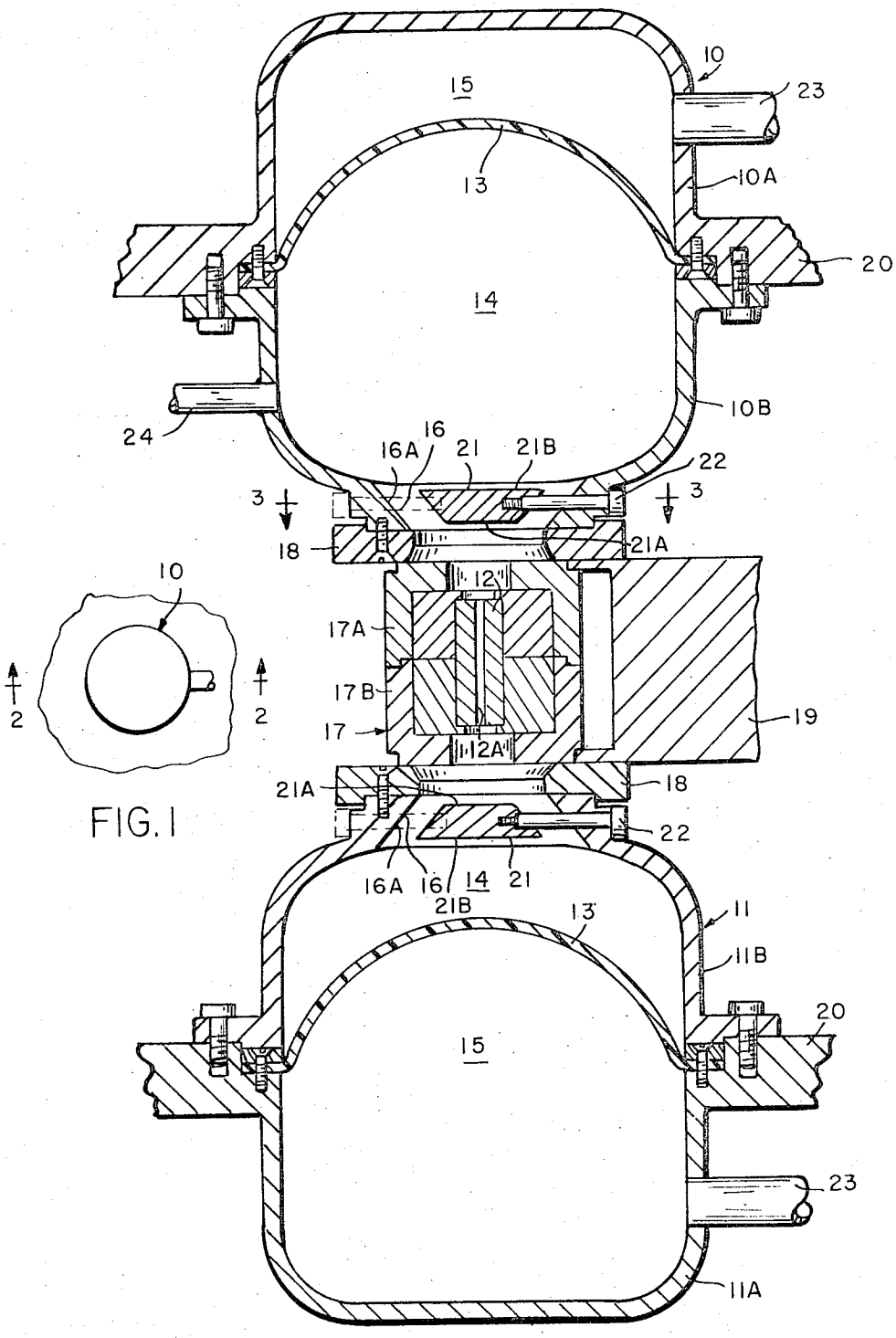

10
15
23
13
10A
20
14
10B
24
16
16A
21
21B
22
3
3
18
21A
12
17A
17B
17
19
12A
21A
18
22
16A
16
14
21
21B
13
11
11B
20
15
23
11A

FIG. 2

10
2
2

FIG. 1

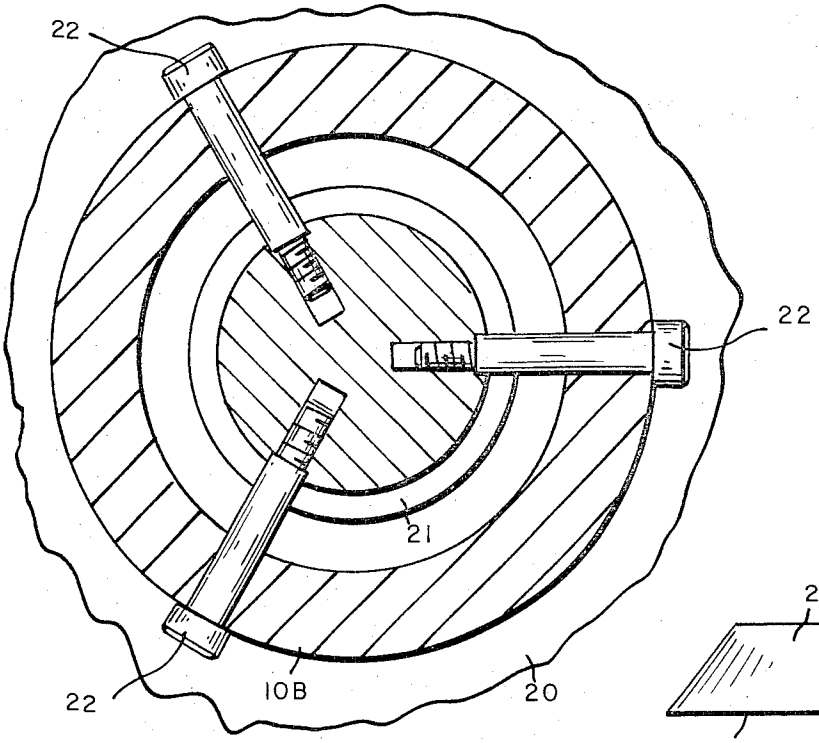


FIG.3

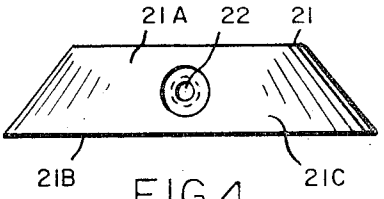


FIG.4

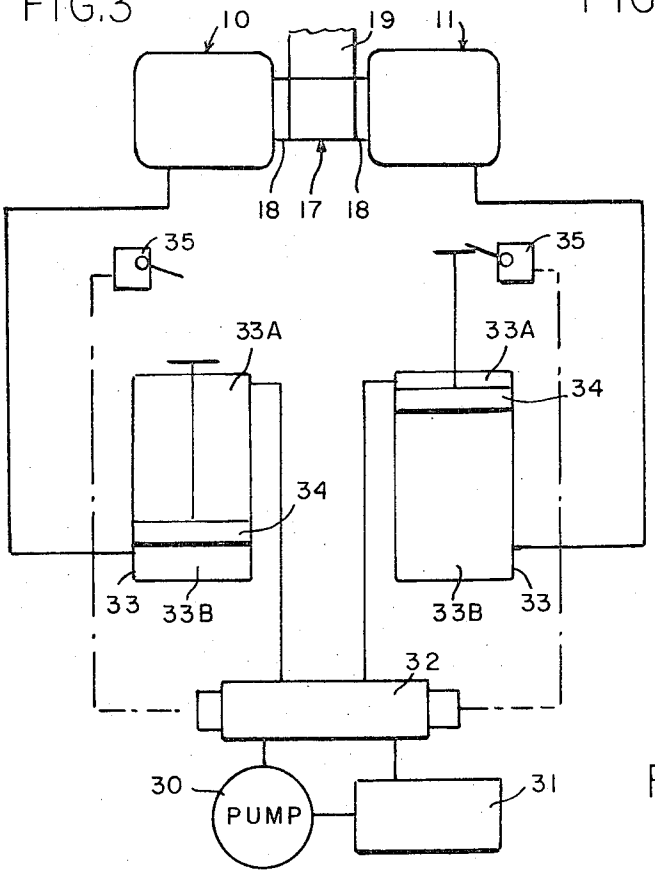


FIG.5

MACHINE FOR FINISHING SURFACES

BACKGROUND OF THE INVENTION

This invention relates to a new and improved machine construction for finishing surfaces of workpieces and the like by forcing and flowing an abrasive composition against surfaces of a workpiece.

Devices of this general type have been disclosed in U.S. Pat. Nos. 2,346,228 and 3,039,234 and many others wherein a flowable abrasive composition is forced under pressure against a surface of a workpiece.

Suitable flowable abrasive compositions for use in this invention are also disclosed in the aforementioned U.S. Pat. No. 2,346,228 or are sold by Dynetics Corp. of Woburn, Mass. under the trademark Dynaflow.

It has been discovered that in practicing the invention as disclosed in the aforementioned U.S. Pat. No. 3,039,234 using flexible diaphragms as pumps to move the abrasive compositions with the aforementioned Dynaflow brand flowable abrasive compositions, the diaphragms have tended to break more frequently than desirable. This has often occurred after extensive use wherein abrasive composition began to rise in temperature in part while at the same time cooling in part and then collecting in a somewhat hardened condition about the periphery of the diaphragm.

Breakage has often occurred because the diaphragm under these conditions expands more rapidly at its center then at its periphery. In many cases the diaphragm extended to such a degree that it extended into the outlet passage for the abrasive composition with the result that destruction of diaphragm occurred.

SUMMARY OF THE INVENTION

In order to overcome the aforementioned disadvantages, it has been discovered that the placement of a baffle within the passage for the flow of abrasive composition will prevent breakage of the diaphragm without interferring with the flow of abrasive composition. When positioned in this manner the baffle means acts as a stop to limit the expansion of the diaphragm thereby causing the outer periphery of the diaphragm to expand. In addition, it has been found with the preferred baffle constructions of this invention, it is possible to also mix and redistribute the flow of abrasive composition between diaphragm pumps so as to prevent the accumulation of large deposits of cooled abrasive composition about the periphery of the diaphragm.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view with parts broken away illustrating an apparatus incorporating the invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a side view of the preferred baffle construction according to this invention;

FIG. 5 diagrammatically illustrates a mechanism for pumping the abrasive composition back and forth between containers shown in FIGS. 2 and 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

Reference should now be had to FIGS. 1–5 which illustrates a machine for forcing an abrasive composition back and forth to smooth and remove material from a workpiece.

At 10 and 11 there are shown containers or domes, e.g., of steel oriented side by side or one on top of the other and acting as pumps for the passage of flowable abrasive composition against a workpiece 12 positioned therebetween.

The containers comprise top and bottom shell portions 10A, 10B and 11A and 11B. Within each container, there is provided a flexible diaphragm 13 fabricated of elastomeric material conventionally constructed using, e.g., sheet stock of rubber, urethane or other similar materials and which is clamped at its periphery as shown between the shell portions. There is thus provided two chambers 14 and 15 in each container, chamber 14 being for the storage of abrasive composition and chamber 15 being for application of a fluid such as oil to pump the abrasive composition back and forth between chamber 14 of the two containers 10 and 11..

In FIG. 2, the bottom diaphragm 13 (container 11) is shown extended upwardly (but not fully) towards the workpiece 12 by the force of oil under pressure in chamber 15 against it while the diaphragm 13 in the top container 10 is in just the opposite position.

At the outlet of each chamber 14 and 15 there is provided a passageway or orifice 16 for the flow of abrasive composition back and forth through the workpiece 12.

As shown in FIG. 2, the workpiece 12 is positioned in a fixture 17 comprising halves 17A and 17B for positioning the part 12 in place. The fixture has passageways at 17C for the flow of abrasive composition through the bore 12A of the workpiece, e.g., metal.

The fixture 17 sits upon upper and lower slideable surface members 18 coupled to the containers 10 and 11. At 19 there is shown a portion of a mechanism not forming a part of this invention for moving the fixture back and forth into place.

The fixture 17 is held in place between the container passages 16 by means (not shown) coupled between container extensions 20. The means can comprise a hydraulic clamping mechanism or a mechanical screw-down arrangement depending upon the size of the containers, workpiece, pressures used, etc.

Positioned within each of the passageways 16, there is provided a baffle 21 which is positioned and suspended between the inner wall 16A of the passageway by bolts 22 extending inwardly from the outside of the containers 10 and 11.

The baffles 21 act as stops to prevent overextension or expansion of the diaphragm 13. The baffles are also preferably shaped as a plate having a top surface 21A smaller in width than bottom surface 21B with the surfaces 21A and 21B preferably being parallel. Each baffle preferably also includes sloping sidewall means 21C which are shaped to cause dispersion and mixing of the abrasive composition as it flows into the chamber 14. Most preferably the walls 21C are sloped as shown to effectively direct the abrasive composition towards the

periphery of the diaphragm as it flows into the chamber thereby tending to prevent the accumulation of cooled and thus thickened abrasive composition about the periphery of the diaphragms. In its most preferred construction the baffle is shaped as a truncated cone although other shapes such as a truncated pyramid, cone, etc., may be used so long as they provide the two functions enumerated above in this type of machine.

In the preferred case, it has been found that the distance between the sidewall **21C** of the baffle wall **16A** should be at least two times the diameter of the bore of the workpiece to get good results and that the distance between wall **21C** and **16A** should most preferably be three times the diameter of the workpiece bore. In addition, it is most preferable that the sloping sidewall **21C** be parallel to the sloping wall **16A** of the passageway.

At **23** in FIG. **2** there is shown conventional piping for feeding oil into the chamber **15** from a source as shown in FIG. **5** and at **24** in FIG. **2** there is shown an inlet pipe for supplying abrasive composition into the chamber **15**.

Reference should now be had to FIG. **5** which shows a conventional setup for pumping oil and thus abrasive composition back and forth against the workpiece. At **30** there is shown a conventional pump with motor connected to an oil reservior **31** and which are both coupled to a conventional four-way electromagnetically actuated valve **32**. At **33** there are shown cylinders having pistons **34** supported therein. The pistons **34** are adapted to move up and down in FIG. **5** due to the flow of oil into or out of the cylinder portions **33A** depending upon the condition of the valve **32**. The pistons are adapted to move a predetermined amount of oil in the lower portions of the cylinder at **33B** into the container chamber **15** to force the movement of the diaphragms **13** in a sequence to move the abrasive composition back and forth between containers **10** and **11**.

To operate the valve **32** to move the abrasive composition in a predetermined sequence, switches **35** are provided which are actuated by rods **36** coupled to the pistons **34** and which cause valve actuation when they have risen a predetermined distance to reverse the flow of oil into the chambers **33A**.

I claim:

1. In a machine for smoothing and removing material from an article which includes a container having a passageway for receiving a quantity of flowable abrasive composition, a diaphragm within the container for supporting the composition and for pushing the same through the passageway, the improvement comprising baffle means positioned within the passageway for limiting the expansion of the diaphragm into the passageway, said means also shaped to cause the composition to be mixed as composition flows into the container through the passageway.

2. In a machine according to claim **1** in which the baffle is in the shape of a plate having top and bottom surfaces and sloping sidewall means between said top and bottom surfaces.

3. In a machine according to claim **2** in which the baffle is in the shape of a truncated cone.

4. In a machine according to claim **2** in which the baffle is wider at its surface closest to the diaphragm.

5. A machine for forcing an abrasive composition back and forth through or about a workpiece, said machine comprising a pair of containers, each of said containers having a diaphragm therein which separates the containers into two chambers, one for holding the abrasive composition and the others for holding fluid to move the diaphragm back and forth, a passageway coupled to each of said containers for the entry and exit of the abrasive composition into and out of said chamber for holding the abrasive composition, means for positioning a workpiece between said passageways to permit the flow of abrasive composition from one container to the other container, and baffle means positioned in the passageways leading into each container for limiting the expansion of said diaphragm as it pushes abrasive composition through said passageways, said baffle also shaped to mix the abrasive composition uniformly as it flows into the container chambers.

6. A machine according to claim **5** in which means are positioned for forcing said diaphragms to move to force abrasive composition through said passageways.

7. A machine according to claim **5** in which said baffle means are positioned in the passageways so that the abrasive composition flows between the sidewall of the baffle and the inner wall of the passageway.

8. A machine according to claim **7** in which in each passageway the part of the baffle facing the diaphragm is wider than the top thereof positioned farthest away from the diaphragm.

9. A machine according to claim **8** in which the baffle is in the shape of a truncated cone.

10. A machine according to claim **1** in which the baffle means includes a sidewall which slopes and is substantially parallel to the inner wall surface of the passageway.

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