

Big Wall Forum

Big Wall Climbing Forum--brought to you by the deuce!

News:
"If yer not big wallin', yer stallin." - Mike.

Author — Topic: Open Source Monkey Paw drawings (Read 3681 times)

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deuce4

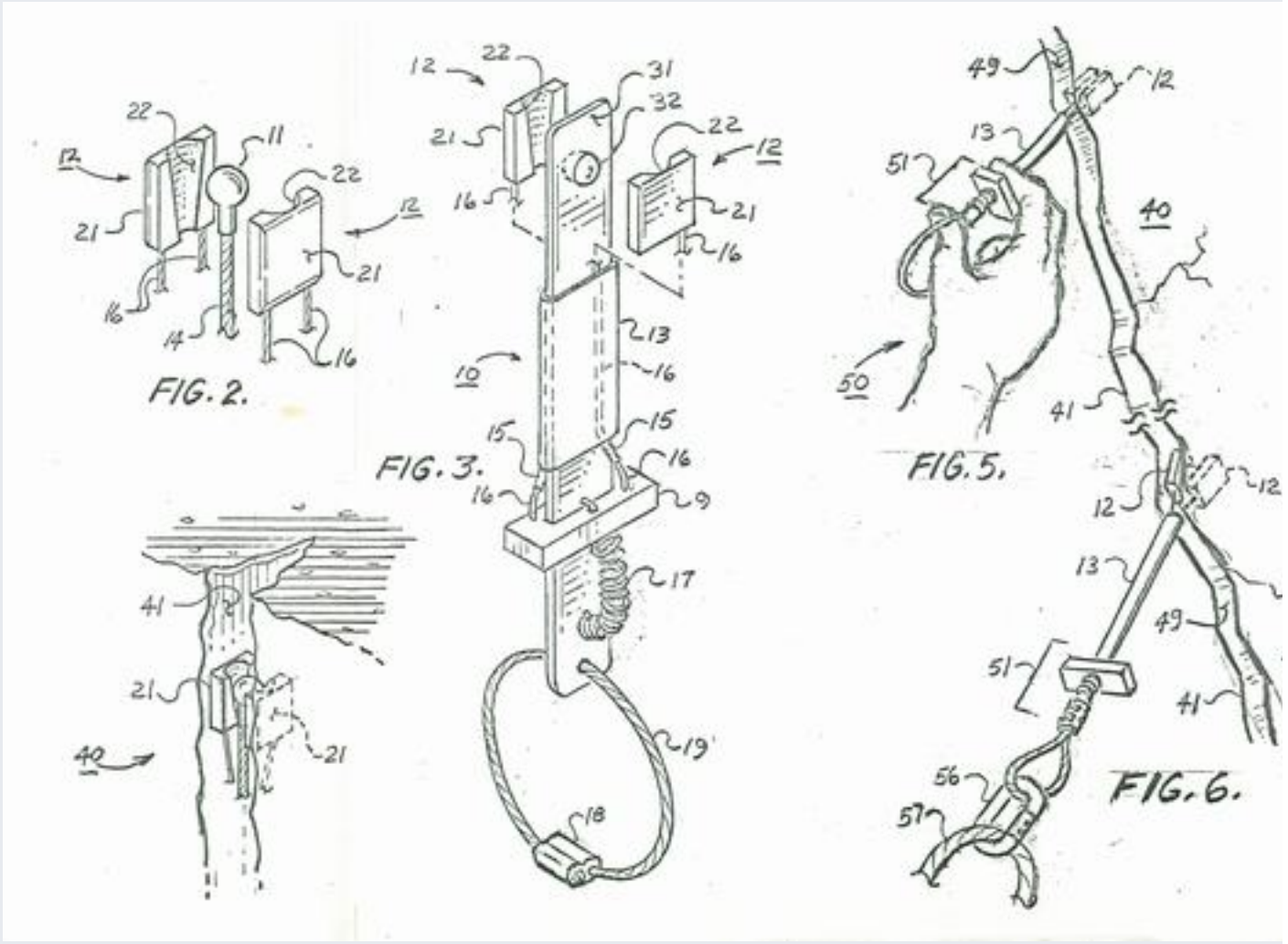
The Deuce
Administrator
A3+ Copper Bender

Posts: 182

Open Source Monkey Paw drawings

« **on:** November 26, 2006, 10:42:56 am »

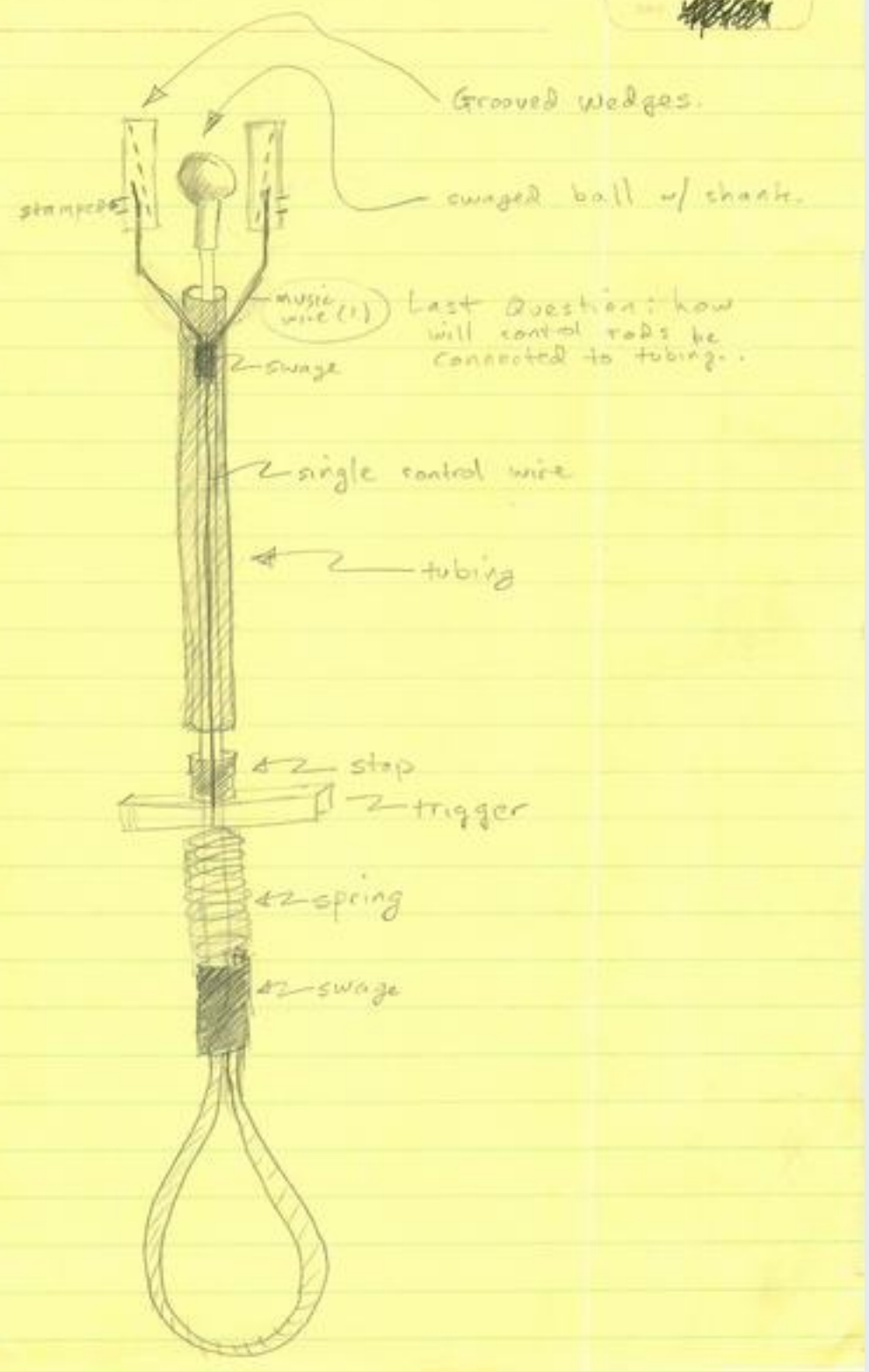
By Request, these are a few of my design notes for the original ball and groove chock, the Monkey Paw:



5 - 4

4/89

Design



5/15

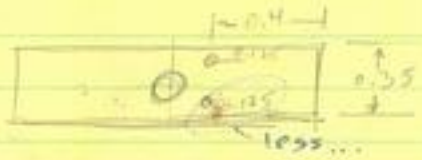
Specs – Monkey Paw #2 Finished Version

3 Drill sizes used (should try non-shaft balls.)

- 0.193" for clearance hole in wedges - maybe smaller
- 0.152 for cable hole in trigger
- 0.094" for 3/64" cable hole - maybe smaller

1x19 1/8" Stainless cable (7x7 would do).

1x19 3/64" cable for trigger wire (9" per unit)



trigger bar 1" long / 0.190 thick

13.5° Grooved wedge

Sleeve Tubing: "Flexible" Nylon 11 Tubing - Maybe too stiff (0.137 ID) - doesn't need stop, through

Spring Specs: try part # 9657K42 ← (K=0.90) spring constant 3.93 too stiff

Also need Heat-Shrink tubing

Final Range → 0.310 to 0.500 exactamundo.

Alan

Specs – #2 Monkey Paw

Alan
A, H Stamps
Sample M.Paw

Ball = 5/16" = 0.313"

(1) Wedge – Initial Shape

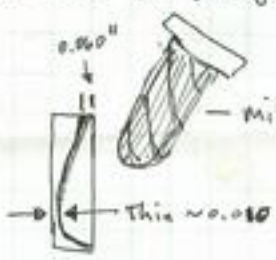
Mill/chop from Aluminum Stock

(requires 2 cable holes on side of the wedge)

• 5/16" Ball End Mill for Groove

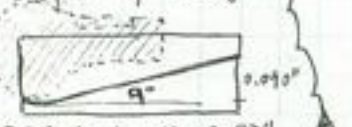
Angle Markings on Mill is lower mark

(2) Mill Groove in Wedges. Use 10° Groove Angle.

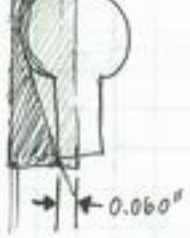


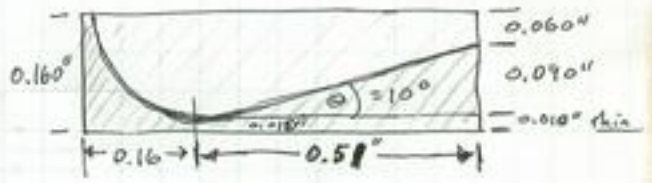
– Mill Bit – Tilt Milling Head 10°

This is the "closed-top" design.
Also possible is the "open-top" design



use 9° Angle, Length = 0.57"





Theoretical Range = 0.333" – .513"

(3) Finish – Cable Size 1x19 3/64" = 0.047 (#55 or #56 drill?)

Experiment all you like, but be careful of the actual Angle.
8°: too shallow – tends to get stuck.
12°: makes unit too short to be practical.
→ correct angle between 10° and 11° ←

Conversion
369 x psi = lbs

Basalt Tests 5/11/90

Test #1
Tiny TGV in good placement.
1509 lbs. Middle Cam Breakage.

Test #2
Monkey Paw #2 - Double Flaring Placement. Slight Negative Flare in dir. of pull.
Skated out at 773 lbs. No damage to nut.

Test #3
Same Monkey Paw as Test #2. Better Placement.
Broke at swage at 1840 lbs.

Test #4
Ball Nut #2, well used and worn. Good placement, slightly positive flare.
Cable broke at solder joint on wedge at 2208 lbs. Chain running over edge.

Test #5
Monkey Paw #2, ratty and old. Good placement in positive flare.
Rock broke around placement at 2208 lbs. No damage to nut. Chain over edge.

Test #6
Monkey Paw #2, same as Test #5. Good Parallel Placement.
Skated out of placement at 1693 lbs.

Test #7
Monkey Paw #2, same as above. Very dubious placement.
Skated out at 662 lbs.

Test #8
Monkey Paw #2, same as above. Good Placement.
Broke at swage at 1693 lbs.

Test #9
#2 Copperhead. Well placed by Alan Humphreys. Outward pull @ 30°
Broke at top swage at 1141 lbs.

Test #10
1st Prototype Micro-Paw w/ cable axle. OK placement.
Mangled and pulled out at 1141 lbs. Chain over edge.

Test #11
Ball Nut #1. Expanding Crack.
Skated out at 1030 lbs. Some Solder loss. Chain over edge.

Test #12
Ball Nut #1. Expanding Crack.
Skated at 993 lbs. Chain over edge.

Basalt Tests — Measure size of #1 Ball thing — [3.68 x psi = lbs]

Tiny TCU

#1 • Popped @ 410 psi 1250 psi middle Cam Breakage.

#2 Monkey Paw #2 Test #2 Slightly Flaring placement. (Double flarius)
• Popped at 210 psi Skated out of placement

#3 → Test #3 Slightly Better Placement
Popped 500 psi - Broke at Swedge.
very well used and worn.

#4 #2 Ball Nut. Decent Placement, slighty pos(+) flare.
Chain running over slight edge.
600 psi - cable broke at solder joint on wedge.

#5 #2 Monkey Paw in good positive Flare. Ratty used Monkey Paw.
Chain going over edge. 600 psi. Rock broke at Edge.
Pulled out in similar condition as placed.

#6 #2 Monkey Paw Good Parallel Placement. (Same as test #5)
460 psi Skated out of placement.

#7 #2 Monkey Paw. 180 psi - skated out. dubious placement

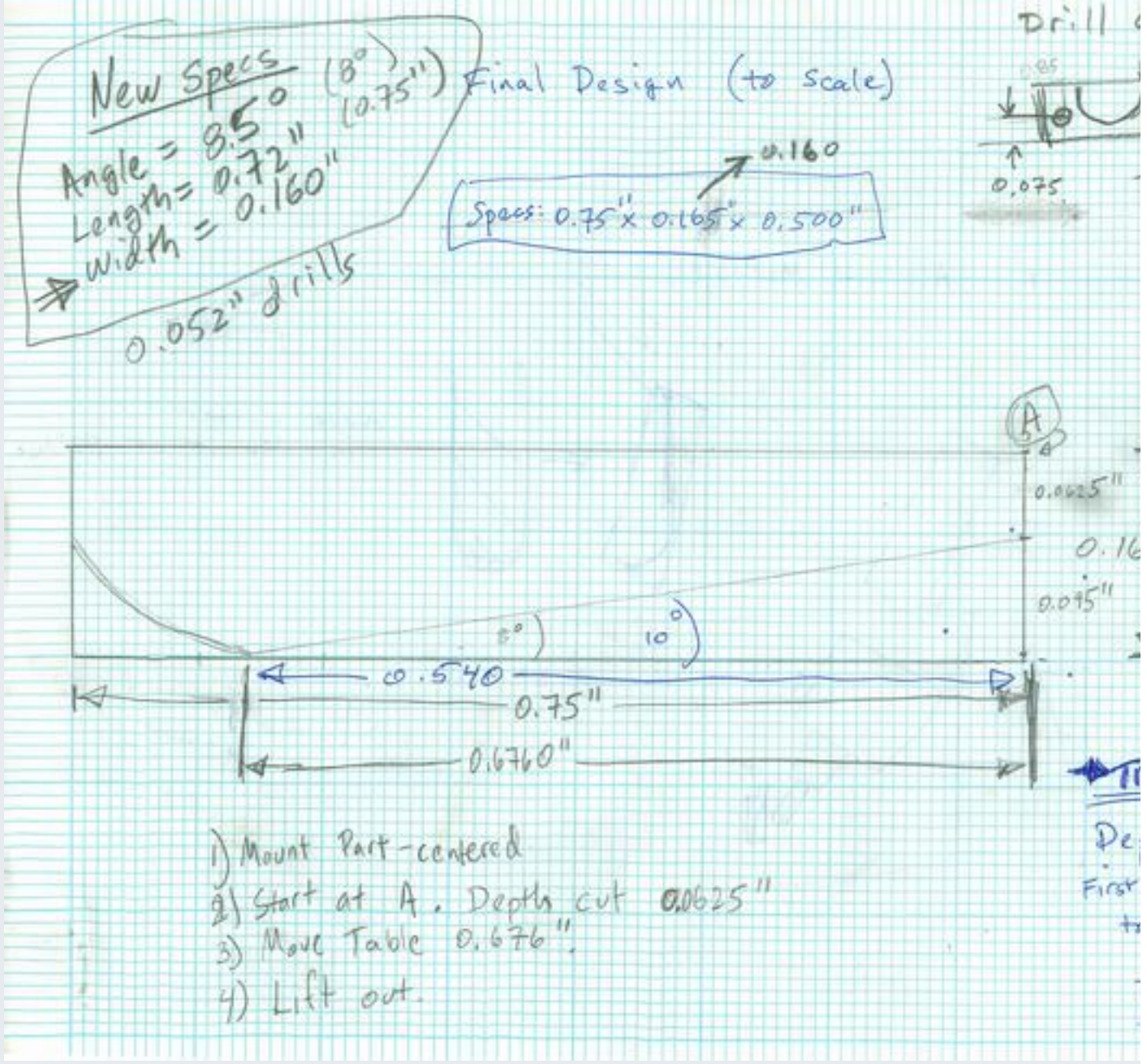
#8 #2 M. Paw. Good Placement. 460 psi. Broke at Swage

#9 #2 Copperhead - pull outward 30° Angle. Good placement.
310 psi → Broke at top swage.

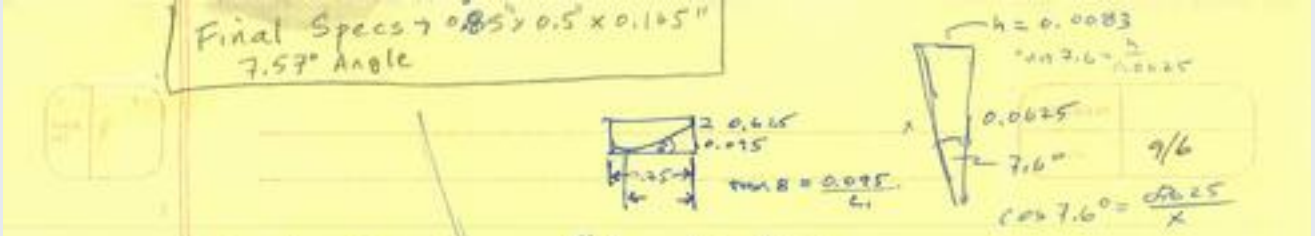
#10 1st Prototype Micro Paw w/ cable axle. ok placement. chain over edge.
380 psi - kinda got mangled.

#11 #1 Ball Nut. Chain over edge. 280 psi.
Skated. Some Solder loss.

#12 #1 Ball Nut Expanding Crack. 278 psi

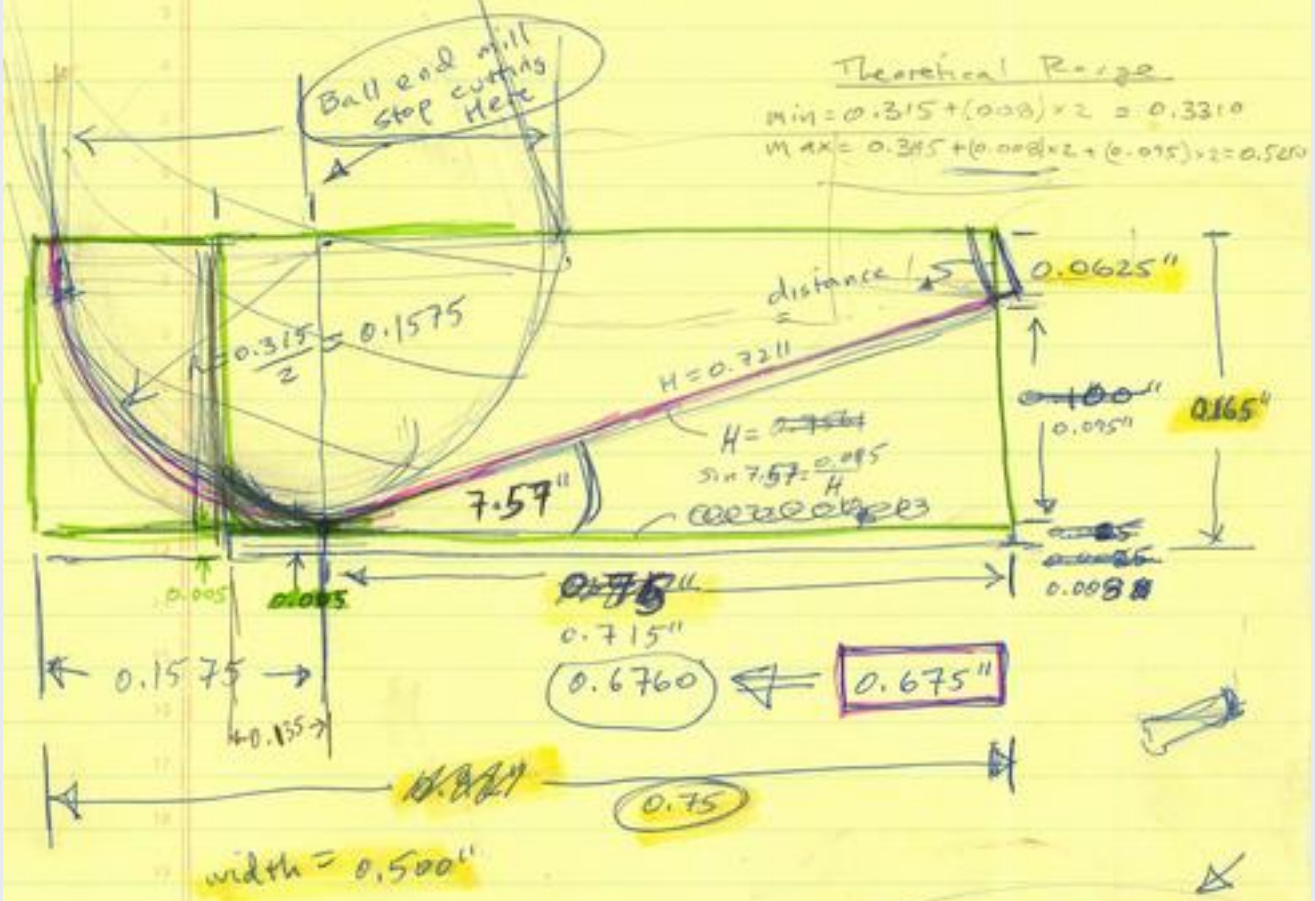

New Specs
Angle = 8.5°
Length = 0.72"
width = 0.160"
0.052" drills
(8°)
(0.75")
Final Design (to scale)
Specs: 0.75" x 0.165" x 0.500"
0.160
Drill
0.075
A
0.0625"
0.095"
8°
10°
0.540
0.75"
0.6760"
1) Mount Part - centered
2) Start at A. Depth cut 0.0625"
3) Move Table 0.676".
4) Lift out.

Final Specs → 0.5" × 0.5" × 0.165"
7.57° Angle



Final Design #2 Wedge

Range = 0.315 + .0025 × 2



1) start w/ Rectangle: 0.85" × 0.500" × 0.165"
2) Mill groove: • start at end – centered
   • Depth cut 0.0625" (7.57° angle) ⇒ 0.0631"
   • Move table 0.721" (7.57° angle) ⇒ 0.721"
   • Finished – drill wire holes.

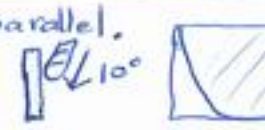
Mount Block at exactly 7.57° angle.

3/16 = 0.1875
5/32 = 0.15625

Material comes in 0.160" sheets.

Step 1: Cut Steel to .70"
(Sand down if necessary)
(Allow tollerance for blade thickness!)

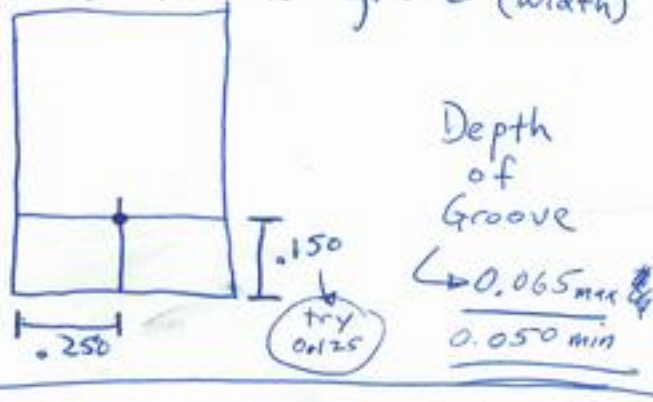
Step 2: Set end pieces in the parallel.
Set mill to ∢ 10°
Mill Groove



Step 3: Mark and punch for 1/16" groove (width)

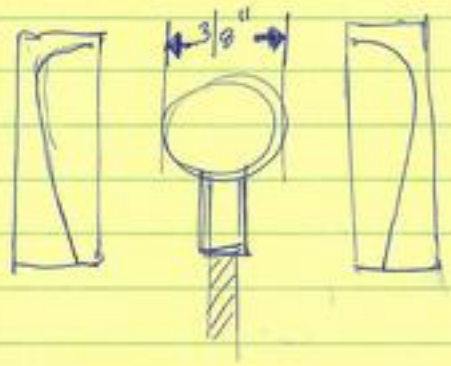
.050	.010	.195
.055	.010	.185
.060		.175
.065		.165

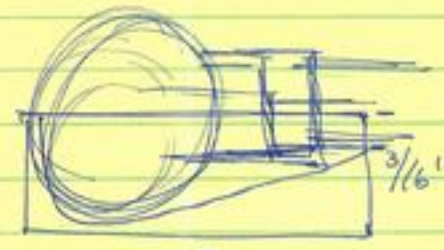
Mill groove

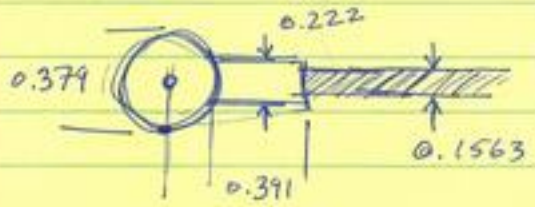


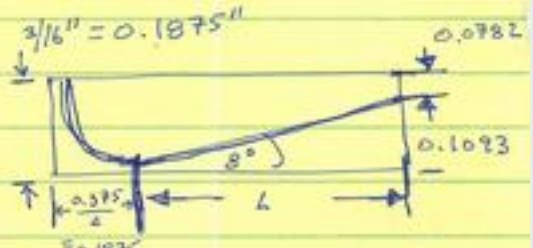
Step 4: Solder 1/16" cable into groove

#3 Production Outer Members





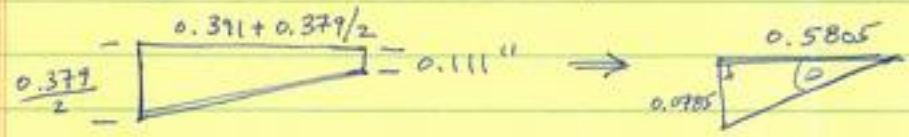




$\tan 8° = \frac{0.1093}{L}$

$L = \frac{0.1093}{\tan 8°} = 0.7777$

Total length = 0.9652



$\tan\theta = \frac{0.0785}{0.5805}$

$\theta = 7.70°$

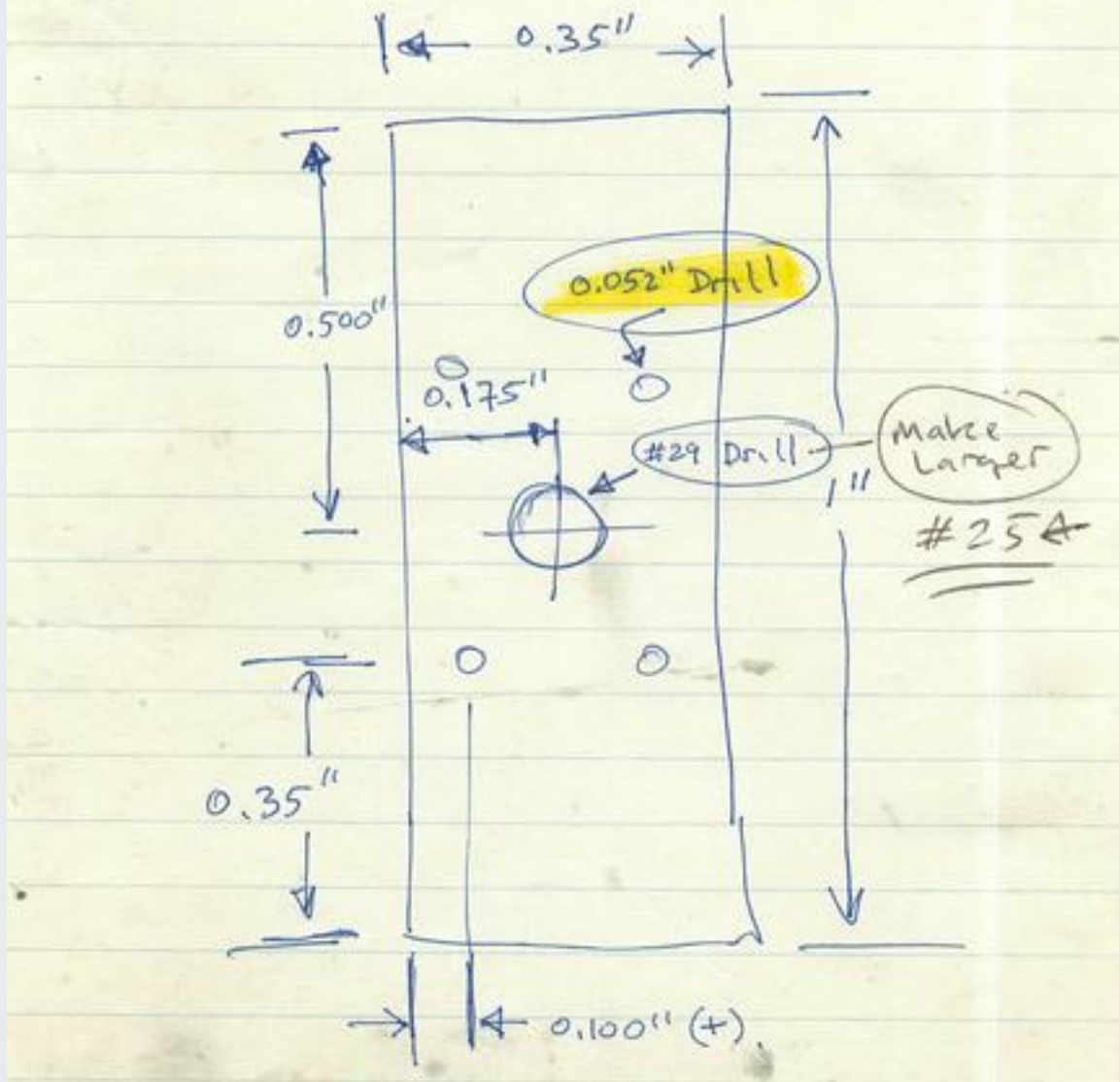
→ 8°

Material List #2

- 0.160" 7075-T6 Aluminum.
- Trigger material.
- 5/16" Ball with 7x7" Cable (Ver Sales).
- Trigger cable 1x19 3/64" (McMaster)
- Inner Tube: 0.062" Polyethylene → 0.053" ID Thinwall Teflon. (my)
- Outer Tubing (triggers): # 5173K22 Flex. Nylon 0.138" ID
- Heat Shrink Tubing: Polyolefin Thin Wall (white 0.375" ID)
- Spring A: McMaster #9657K52
- Spring B: McMaster #9656K17

→ Also Need set of parallels

Specs – trigger (0.200" thick)



Final Specs - short Version

8.5 (± 0.25) Degree Angle

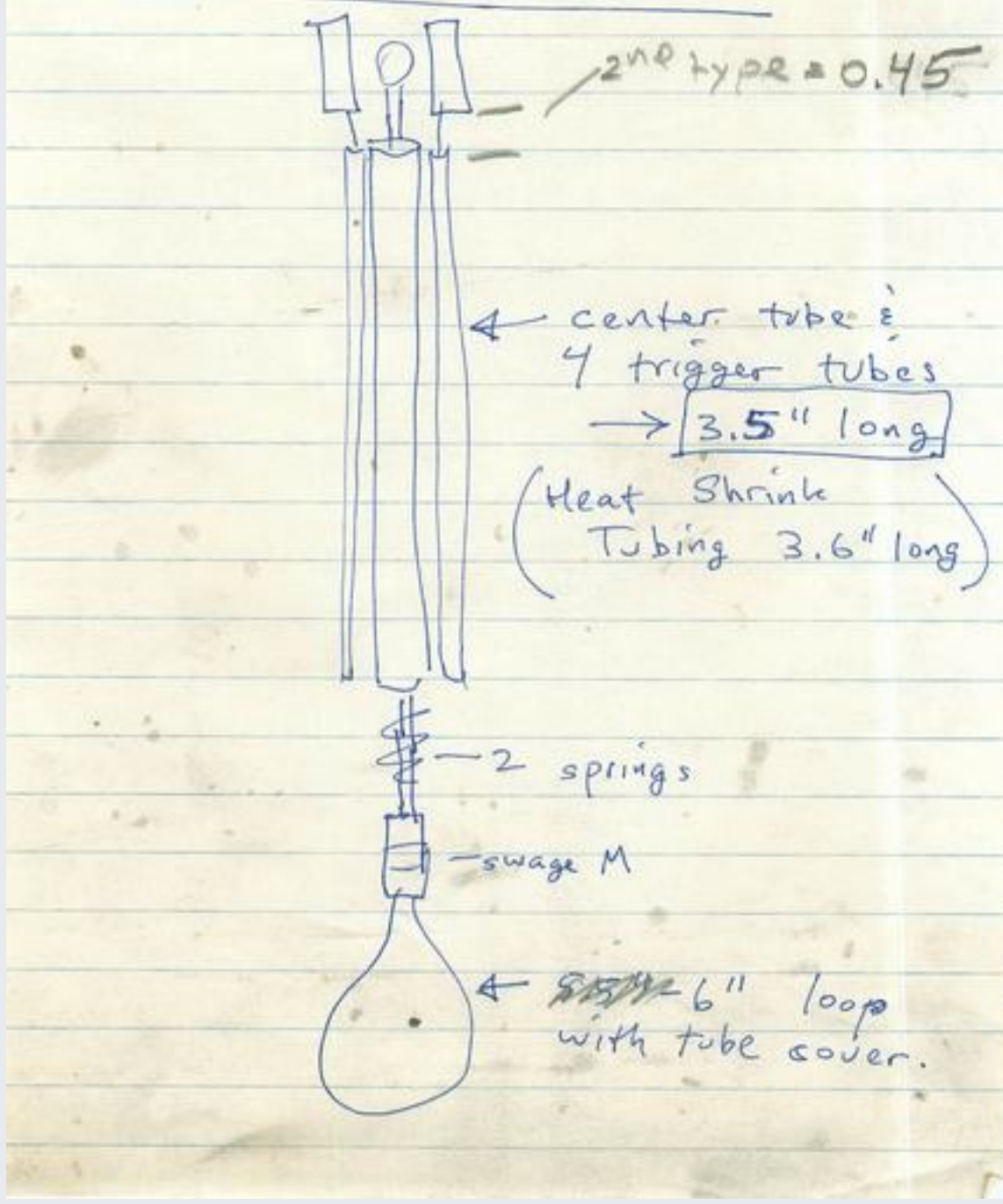
Width = 0.160"
Length = 0.720"

Long Version

Angle = 8°
Length = 0.75
width ≈ 0.170"

5/16" + 0.13

Specs - final Assemby



TUBESALES

Tubular Products in Carbon Steel, Alloy Steel, Stainless Steel, Aluminum, Nickel and Hastelloy

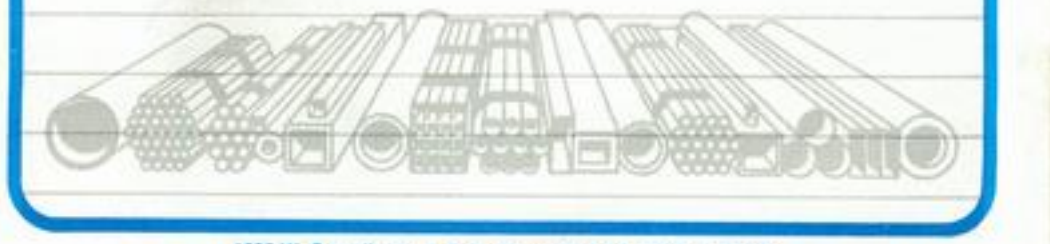
Order Ball & Cable from VER Sales
818-842-4838

Single Shank Ball MS 20664

MS Part Number	BS Spherical Ball Diam.		Cable Size
MS20664C3	0.253	Be sure to specify spherical ball fittings	3/32"
MS20664C4	0.315		1/8"
MS20664C5	0.379		5/32"

Specify Cable Type (7x7 or 1x19)

Price dependent on quantity.



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Thanks for visiting the Big Walls Forum!!
John Middendorf

deuce4

The Deuce
Administrator
A3+ Copper Bender

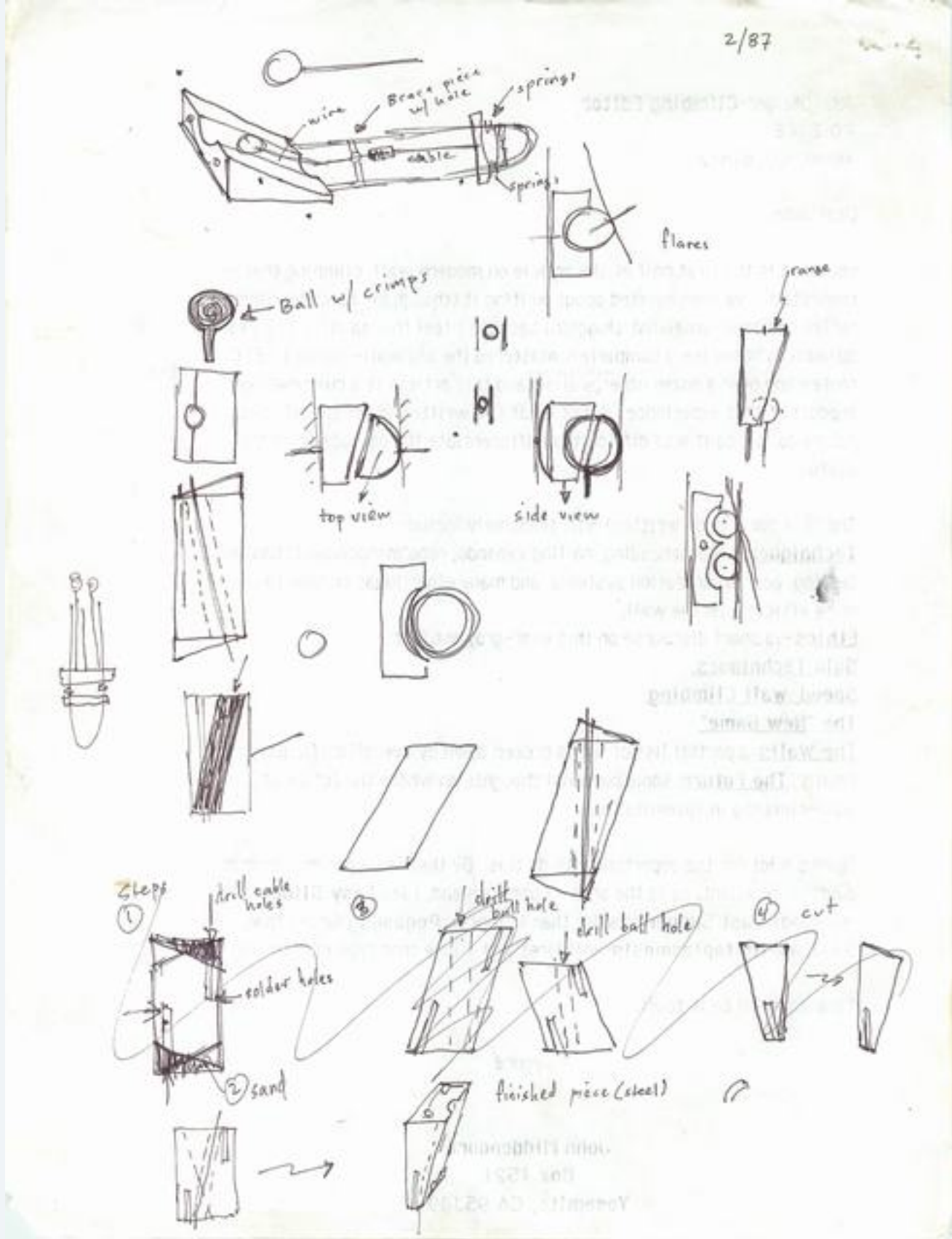
Posts: 182

Re: Open Source Monkey Paw drawings

« **Reply #1 on:** November 26, 2006, 10:49:41 am »

And just for the record, these are the original drawings from 1987 that document the origin of the idea (posted on Supertopo, too):

2/87


wire
Brace piece w/ hole
springs
cable
springs
flares
Ball w/ crimps
range
top view
side view
Steps
① drill cable holes
solder holes
② sand
③
drill ball hole
drill ball hole
④ cut
finished piece (steel)

9/87

Actually, for mid-range sizes, the double wedge/ball will probably be the ticket

Figure possible range

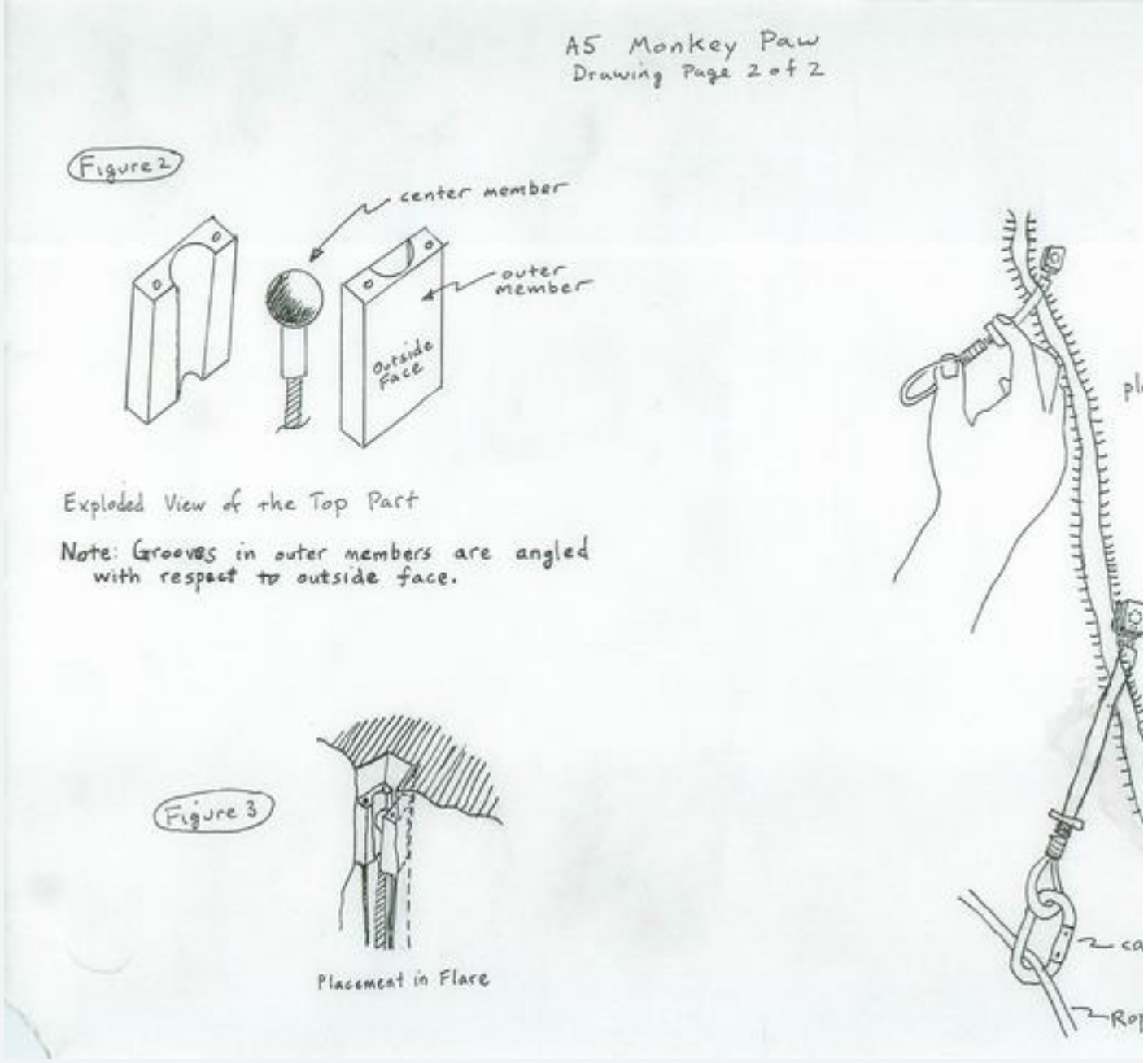
- depends on thickness and length

- problem of stability

Here we seek to maximize another advantage: the ability of the parts to rotate about and create a "perfect wedge" (ing) independent on the rock configuration. With any flare.

Minimum size is also desired.

one way to make them smaller ~~(of course!)~~ is to eliminate the wedge of the second side.



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Thanks for visiting the Big Walls Forum!!
John Middendorf

deuce4

The Deuce
Administrator
A3+ Copper Bender

Posts: 182

Re: Open Source Monkey Paw drawings

« **Reply #2 on:** November 26, 2006, 10:53:13 am »

And here are some pictures of the few that have been salvaged over the years (most were tested or used extensively on routes!):

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Thanks for visiting the Big Walls Forum!!

John Middendorf

the_dude

A3+ Copper Bender

Posts: 213

Re: Open Source Monkey Paw drawings

« **Reply #3 on:** November 26, 2006, 11:29:29 am »

Looks pretty interesting. I could never have the imagination to come up with stuff like that. Did they ever go into production? How did the monkey paws work compared to the ones out today?

Logged

deuce4

The Deuce
Administrator
A3+ Copper Bender

Posts: 182

Re: Open Source Monkey Paw drawings

« **Reply #4 on:** November 26, 2006, 01:51:26 pm »

The idea, like all ideas, was an evolution from thinkng about the existing technology. From the generic idea of stacked nuts, Charlie Porter came up with a two-piece connected version in the 1970's, which were not well known and were never sold commercially. Many years later, in the mid-1980's, Metolius cam out with the Slider, a rigid sliding two-piece nut. Soon after, Don Best cam up with Quickies, then there were Rock and Rollers. Quickies had a property that the second smaller sliding piece could rotate and wedge into irregular spots.

From these concepts, I realized that the ultimate sliding nut would be able to configure itself into any sort of flaring crack. From there, it was a conceptual leap to realize that a ball and grooved wedge would fit the bill. It was a moment of "ah-ha", knowing that I had come up with something that would really work and was a conceptual breakthrough.

Once I started thinking about a ball and grooved wedge, I then did force analysis, and calculated that the Monkey Paw (as it later came to be known, it was Walt Shipley who helped with the name) actually had a force diagram very similar to camming units, and would be very stable. Then it was just a matter of coming up with the best angles and ways to manufacture them.

I made about a dozen or so production models and numerous prototypes, all but a few destroyed by testing or out in the hands of a few select climbing buddies for feedback purposes. I never went into production for commercial purposes.

The idea was stolen by the so-called "inventor" of the Lowe Ball (who actually was a very good machinist, but not a very good designer), after I disclosed the idea to him during a trip together to the Bean Fest in Tucson--in the fall of 1986. I remember upon telling him about the idea, his response was completely negative, saying a ball and groove would never work (he imagined it slipping out or something). But as an engineer, I knew it was the answer. I made a grooved wedge and brought a ball bearing into his shop in Flagstaff, which once he saw, he realized the potential and started making his own prototypes. Soon after, he shamelessly stole the idea as his own, and patented everything secretly before selling the idea to Lowe for $10,000. When I confronted him about it all, after the news of the patent and the sale became public (in 1988), he told me that he had had the idea BEFORE the beanfest trip--which was a boldfaced lie.

« Last Edit: November 27, 2006, 08:33:59 am by deuce4 »

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Thanks for visiting the Big Walls Forum!!
John Middendorf

cosmin

Re: Open Source Monkey Paw drawings

Gumby

« **Reply #5 on:** November 29, 2006, 08:19:29 am »

http://www.needlesports.com/nutsmuseum/morenutsstories.htm

Logged

Posts: 10

"There is no answer in this book (My Vertical World) to the endless question about the point of expeditions to the Himalayan giants. I never found a need to explain this. I went to mountains and climbed them. That is all."
Jerzy Kukuczka

mungeclimber

Administrator
A4+ Dreamer

Posts: 2257

Re: Open Source Monkey Paw drawings

« **Reply #6 on:** December 01, 2006, 10:58:28 am »

Deuce, ya, tis the trouble with sharing ideas or 'going in together' on a project. Peeps will pull out with no regard for the duty of partnership and a sense of implied right of first refusal that means.

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